

Service

Service

Service

LC4.7E
AA



For PDP see: Supplement service manual for SDI plasma panels, 312278514940

Service Manual

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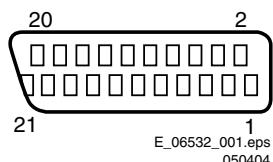
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External 2: Video CVBS/YC - In/Out, Audio - In/Out**Figure 1-3 SCART connector**

1 - Audio R	0.5 V _{RMS} / 1 kohm	⊕
2 - Audio R	0.5 V _{RMS} / 10 kohm	⊕
3 - Audio L	0.5 V _{RMS} / 1 kohm	⊕
4 - Ground Audio	Gnd	⊖
5 - Ground Blue	Gnd	⊖
6 - Audio L	0.5 V _{RMS} / 10 kohm	⊕
7 - Video C	0.7 V _{PP} / 75 ohm	⊕
8 - Function Select	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9 - Ground Green	Gnd	⊖
10 - Easylink P50	0 - 5 V / 4.7 kohm	⊕⊕
11 - n.c.		
12 - n.c.		
13 - Ground Red	Gnd	⊖
14 - Ground FBL	Gnd	⊖
15 - Video C	0.7 V _{PP} / 75 ohm	⊕
16 - n.c.		
17 - Ground Video	Gnd	⊖
18 - n.c.		
19 - Video CVBS	1 V _{PP} / 75 ohm	⊕
20 - Video Y/CVBS	1 V _{PP} / 75 ohm	⊕
21 - Shield	Gnd	⊖

External 1: Video RGB/YUV-In, CVBS-In/Out, Audio-In/Out

1 - Audio R	0.5 V _{RMS} / 1 kohm	⊕
2 - Audio R	0.5 V _{RMS} / 10 kohm	⊕
3 - Audio L	0.5 V _{RMS} / 1 kohm	⊕
4 - Ground Audio	Gnd	⊖
5 - Ground Blue	Gnd	⊖
6 - Audio L	0.5 V _{RMS} / 10 kohm	⊕
7 - Video Blue/U	0.7 V _{PP} / 75 ohm	⊕
8 - Function Select	0 - 2 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	⊕
9 - Ground Green	Gnd	⊖
10 - n.c.		
11 - Video Green/Y	0.7 or 1 V _{PP} / 75 ohm	⊕
12 - n.c.		
13 - Ground Red	Gnd	⊖
14 - n.c.		
15 - Video Red/V	0.7 V _{PP} / 75 ohm	⊕
16 - RGB Ctrl	0 - 0.4 V: INT 1 - 3 V: EXT / 75 ohm	⊕
17 - Ground Video	Gnd	⊖
18 - Ground RGB Ctrl	Gnd	⊖
19 - Video CVBS	1 V _{PP} / 75 ohm	⊕
20 - Video CVBS	1 V _{PP} / 75 ohm	⊕
21 - Shield	Gnd	⊖

Aerial - In

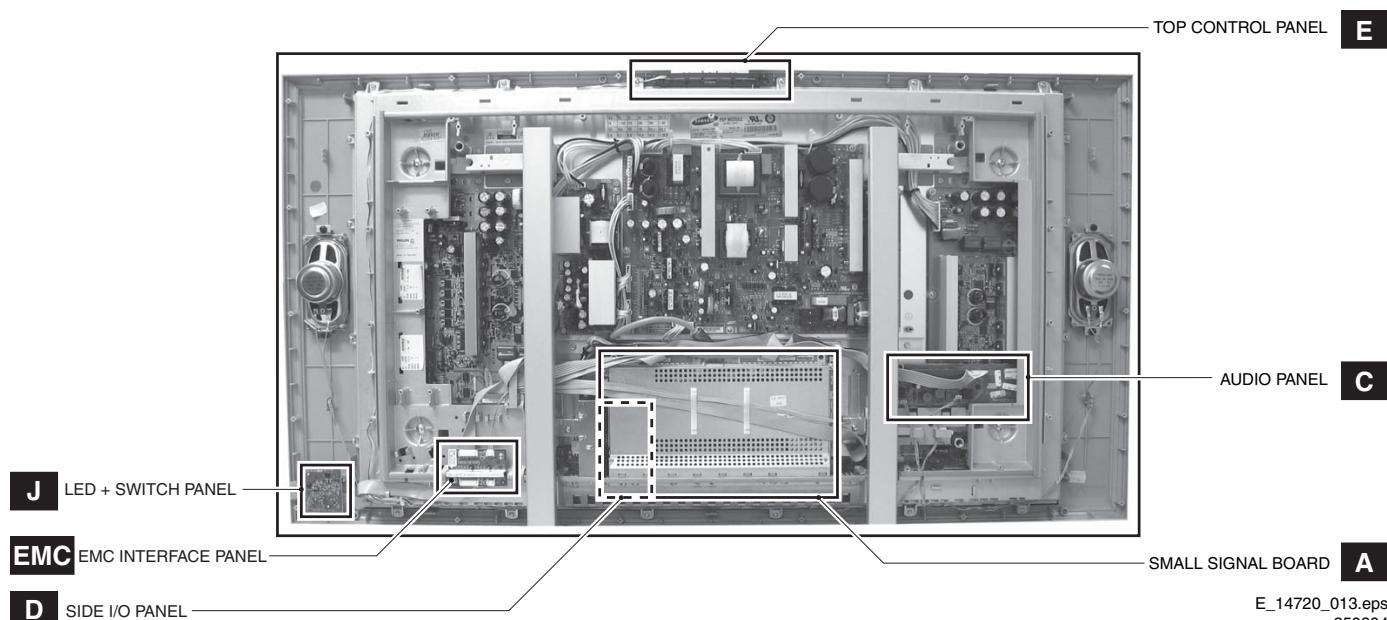
- - IEC-type (EU)	Coax, 75 ohm
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Service connector 1 (UART)

1 - UART_TX	Transmit data
2 - Ground	Gnd
3 - UART_RX	Receive data

Service connector 2 (ComPair)

1 - SDA-S	I ² C Data (0 - 5 V)
2 - SCL-S	I ² C Clock (0 - 5 V)
3 - Ground	Gnd

1.3 Chassis Overview**Figure 1-4 PWB / CBA locations**

2. Safety Instructions, Warnings, and Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:

- Connect the set to the AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol , only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- Route the wire trees correctly and fix them with the mounted cable clamps.
- Check the insulation of the AC Power lead for external damage.
- Check the strain relief of the AC Power cord for proper function.
- Check the electrical DC resistance between the AC Power plug and the secondary side (only for sets which have a AC Power isolated power supply):
 1. Unplug the AC Power cord and connect a wire between the two pins of the AC Power plug.
 2. Set the AC Power switch to the "on" position (keep the AC Power cord unplugged!).
 3. Measure the resistance value between the pins of the AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
 4. Switch "off" the set, and remove the wire between the two pins of the AC Power plug.
- Check the cabinet for defects, to avoid touching of any inner parts by the customer.

2.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.

Available ESD protection equipment:

- Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
- Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.3 Notes

2.3.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground () or hot ground () depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).

- Where necessary, measure the waveforms and voltages with () and without () aerial signal. Measure the voltages in the power supply section both in normal operation (I) and in standby (S). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories. "Dolby" and the "double-D symbol", are trademarks of Dolby Laboratories.

2.3.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads ($\mu = x 10^{-6}$), nano-farads ($n = x 10^{-9}$), or pico-farads ($p = x 10^{-12}$).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.3.3 Rework on BGA (Ball Grid Array) ICs

General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

Device Removal

As is the case with any component that, it is essential when removing an (LF)BGA, the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA.

Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.

After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.

Note: Do not apply solder paste, as this has shown to result in problems during re-soldering.

Device Replacement

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. To reflow the solder, apply a temperature profile according to the *IC data sheet*. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times.

More Information

For more information on how to handle BGA devices, visit this URL: www.atyourservice.ce.philips.com (needs subscription, not available for all regions). After login, select "Magazine", then go to "Workshop Information". Here you will find information on how to deal with BGA-ICs.

2.3.4 Lead Free Solder

Some PWBS in this chassis are "lead-free **prepared**". This is indicated on the PWB by the PHILIPS lead-free logo (either by a service-printing or by a sticker). It does not mean that lead-free solder is actually used!



Figure 2-1 Lead-free logo

3. Directions for Use

You can download this information from the following websites:
<http://www.philips.com/support>
<http://www.p4c.philips.com>

Due to this fact, some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment.
- Use only adequate solder tools applicable for lead-free soldering tin.
- Adjust your solder tool so that a temperature around 217 - 220 deg. C is reached at the solder joint.
- Do not mix lead-free soldering tin with leaded soldering tin; this will lead to unreliable solder joints!
- Use only original spare parts listed in this manual. These are lead-free parts!
- On the website www.atyourservice.ce.philips.com (needs subscription, not available for all regions) you can find more information on:
 - Aspects of lead-free technology.
 - BGA (de-)soldering, heating-profiles of BGAs used in Philips sets, and others.

2.3.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions - reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

4. Mechanical Instructions

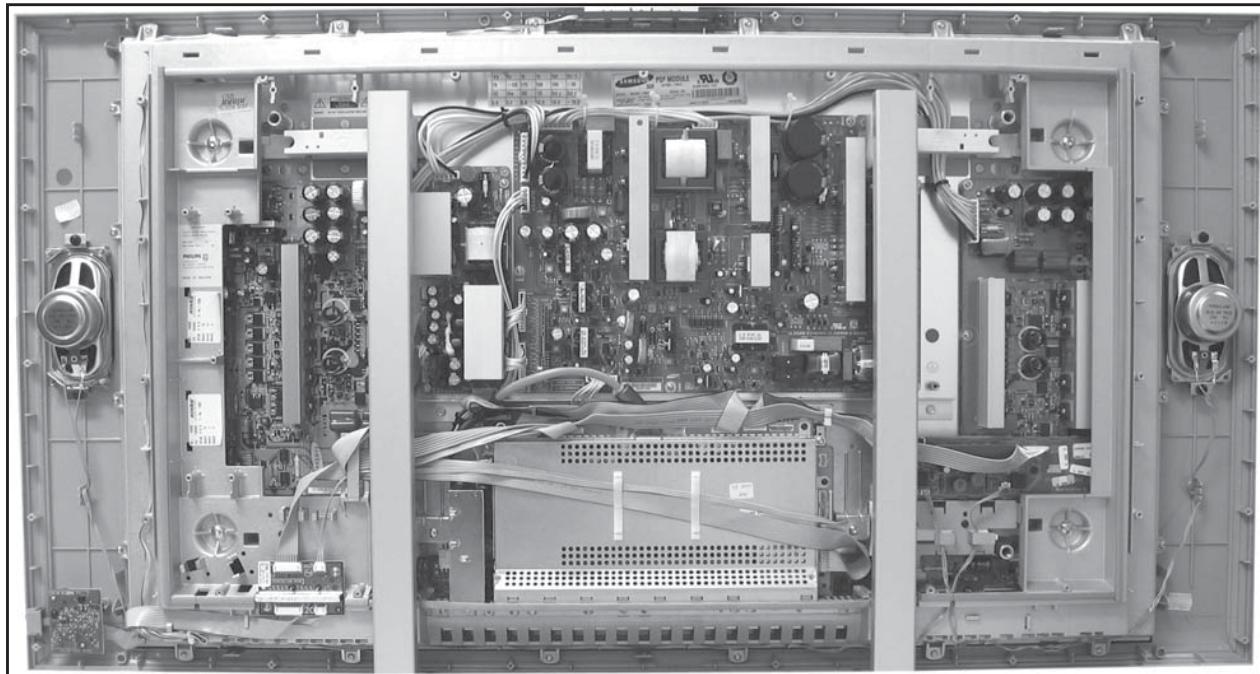
Index of this chapter:

1. Cable Dressing
2. Service Positions
3. Assy/Panel Removal
4. Re-assembly

Notes:

- Figures below can deviate slightly from the actual situation, due to the different set executions.
- Follow the disassemble instructions in described order.

4.1 Cable Dressing



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Figure 4-1 Cable dressing

4.2 Service Positions

4.2.2 Aluminium Stands

For easy servicing of this set, there are a few possibilities created:

- The buffers from the packaging (see figure "Rear cover").
- Foam bars (created for service).
- Aluminium service stands (created for Service).

4.2.1 Foam Bars

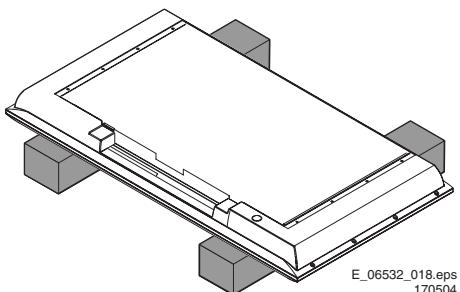


Figure 4-2 Foam bars

The foam bars (order code 3122 785 90580 for two pieces) can be used for all types and sizes of Flat TVs. By laying the TV face down on the (ESD protective) foam bars, a stable situation is created to perform measurements and alignments. By placing a mirror under the TV, you can monitor the screen.

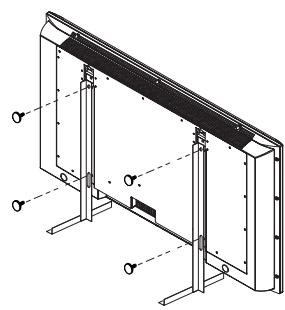


Figure 4-3 Aluminium stands (drawing of MKI)

The aluminium stands (order code 3122 785 90480) can be mounted with the back cover removed or still left on. So, the stand can be used to store products or to do measurements. It is also very suitable to perform duration tests without taking much space, without having the risk of overheating, or the risk of products falling. The stands can be mounted and removed quick and easy with use of the delivered screws that can be tightened and loosened manually without the use of tools. See figure above.

Note: Only use the delivered screws to mount the monitor to the stands.

4.3 Assy/Panel Removal

4.3.1 Metal Back Plate

Warning: Disconnect the mains power cord before you open the set.

1. Place the TV set upside down on a table top, using the foam bars (see part "Foam Bars").
- Caution:** do not put pressure on the display, but let the monitor lean on the speakers or the Front cover.
2. Remove all T10 screws from the metal back plate.
3. Then, remove the four "mushrooms" from the back plate.
4. Lift the back plate from the set. Make sure that wires and flat foils are not damaged during the back plate removal.

4.3.2 Rear Cover

1. Remove the screws that secure the rear cover. The screws are located at the top, bottom, left and right sides.
2. Lift the rear cover from the cabinet. Make sure that wires and flat foils are not damaged during cover removal.

4.3.3 EMC Interface Panel

1. Disconnect the cables from the panel.
2. Remove the fixation screws.
3. Take out the panel.

4.3.4 LED/Switch Panel

1. Remove the fixation screws.
2. Take out the panel.
3. Disconnect the cable from the rear of the panel.

4.3.5 Top Control Panel

1. Remove the fixation screws.
2. Release the two fixation clamps and lift the panel out of the bracket.
3. Take out the panel.
4. Disconnect the cable from the panel.

4.3.6 Small Signal Panel (SSB) and Side I/O Panel

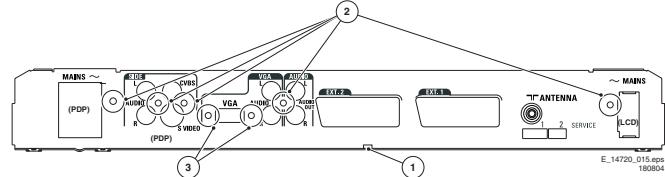


Figure 4-4 SSB Connector plate

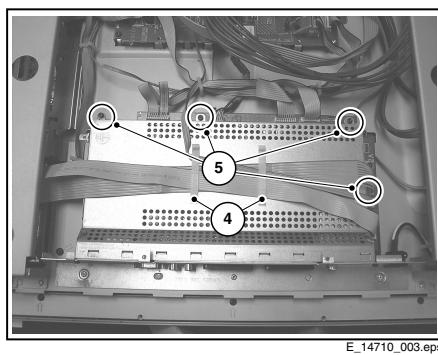


Figure 4-5 Shielding of the SSB

1. Remove the middle fixation screw (1) from the bottom side of the connector plate (as this holds the SSB bracket).
Note: Sometimes it is easier to loosen the complete connector plate and remove it together with the SSB.
2. Remove all connector fixation screws (2) from the front side of the connector plate.
3. Remove the two female screw locks (3) of the VGA connector.
4. Release the plastic cable clips (4) on the shielding and disconnect all cables from the SSB.
Note: Be careful with the fragile LVDS connector on the SSB.
5. Now, completely remove the SSB (together with all the shieldings) from the set.
6. Once the SSB is out, remove the fixation screws (5) from the shielding.
7. Remove the shielding, it hinges at the left side (acc. photo).
8. Remove the fixation screws that hold the panel(s), and take out the panel(s).

Notes:

- Pay special attention to the EMC foam on the SSB shielding. These must be replaced in their initial positions during set re-assembly.
- Insulate the tuner pins, so they cannot touch the shielding (see also figure "SDM Service jumper" in Chapter 5).

4.3.7 Audio Panel

1. Disconnect all cables from the panel.
2. Remove the fixation screws and take out the panel.

4.3.8 Plasma Panel

Important: Be sure to work in a dust free environment during the following activities. In addition, the use of (fabric) hand gloves is advised.

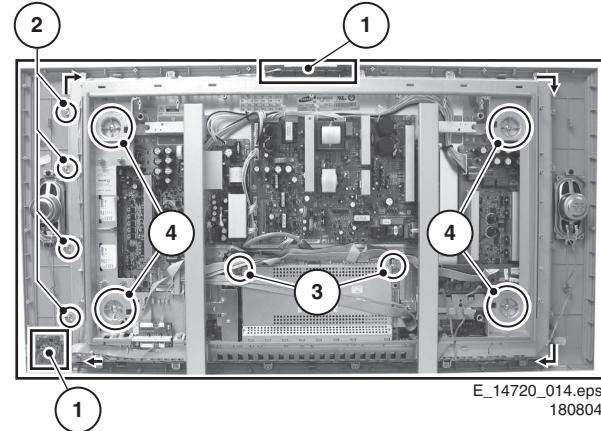


Figure 4-6 Plasma panel disassembly

Disassembly

1. Place the TV set face down on the foam bars. Place the bars at the edges of the set, so they will support the front frame and not only the glass plate!
2. Remove the LED/Switch and Top Control panels (1).
3. Next step is to unplug the following cables (see also "Wiring Diagram" in Chapter 6):
 - AC Power (Mains) plug between Mains Filter and PSU (loosen cable from clamps).
 - All cables on the Audio panel.
 - LVDS plug on SSB. **Caution:** Be careful, because this connection is very fragile!
 - SSB supply plugs on PSU.
 - Audio Panel supply plug on PSU.

- Loudspeaker connections on speakers.
- 4. Remove all T10 parker screws around the frame (2).
- 5. Remove the two T10 tapping screws that hold the SSB (3).
- 6. Remove the four T25 screws (4) that hold the plasma panel.
- 7. Lift the (gold coloured) plastic frame together with its PWBs (except the Audio Panel) from the PDP panel.
- 8. Now the PDP (incl. the PSU and driving panels) can be removed.
- 9. Before sending the plasma panel to the NSO for repair or exchange, remove all its panels.

Assembly

In order to centre the (new) plasma panel correctly w.r.t. the glass plate, do the following:

1. Place the (new) plasma panel face down on foam bars.
2. Also, place the front assy (front panel with glass plate) on two other foam bars.
3. Mount the plastic frame on the plasma panel.
4. Lift the assy (frame and PDP), and place it into the front assy.
5. Now follow the above described disassembly process in reverse order.

4.4 Set Re-assembly

To re-assemble the whole set, execute all processes in reverse order.

Notes:

- While re-assembling, make sure that all cables are placed and connected in their original position. See figure "Cable dressing".
- Pay special attention not to damage the EMC foams at the SSB shields. Control that EMC foams are put correctly on their places.

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:

1. Test Points
2. Service Modes
3. Problems and Solving Tips (related to CSM)
4. ComPair
5. Error Codes
6. The Blinking LED Procedure
7. Fault Finding and Repair Tips

5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or Ixxx. These test points are specifically mentioned in the service manual as "half moons" with a dot in the centre.

Perform measurements under the following conditions:

- Television set in Service Default Alignment Mode.
- Video input: Colour bar signal.
- Audio input: 3 kHz left channel, 1 kHz right channel.

5.2 Service Modes

Service Default mode (SDM) and Service Alignment Mode (SAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between the call centre and the customer.

This chassis also offers the option of using ComPair, a hardware interface between a computer and the TV chassis. It offers the abilities of structured troubleshooting, error code reading, and software version read-out for all chassis.

Minimum requirements for ComPair: a Pentium processor, a Windows OS, and a CD-ROM drive (see also paragraph "ComPair").

5.2.1 Service Default Mode (SDM)

Purpose

- To create a predefined setting for measurements to be made.
- To override software protections.
- To start the blinking LED procedure.
- To inspect the error buffer.
- To check the life timer.

Specifications

- Tuning frequency: 475.25 MHz.
- Colour system: PAL B/G.
- All picture settings at 50% (brightness, colour contrast, hue).
- Bass, treble and balance at 50%; volume at 25%.
- All service-unfriendly modes (if present) are disabled. The service unfriendly modes are:
 - Timer / Sleep timer.
 - Child / parental lock.
 - Blue mute.
 - Hotel / hospital mode.
 - Auto shut off (when no "IDENT" video signal is received for 15 minutes).
 - Skipping of non-favourite presets / channels.
 - Auto-storage of personal presets.
 - Auto user menu time-out.
 - Auto Volume Levelling (AVL).

How to enter

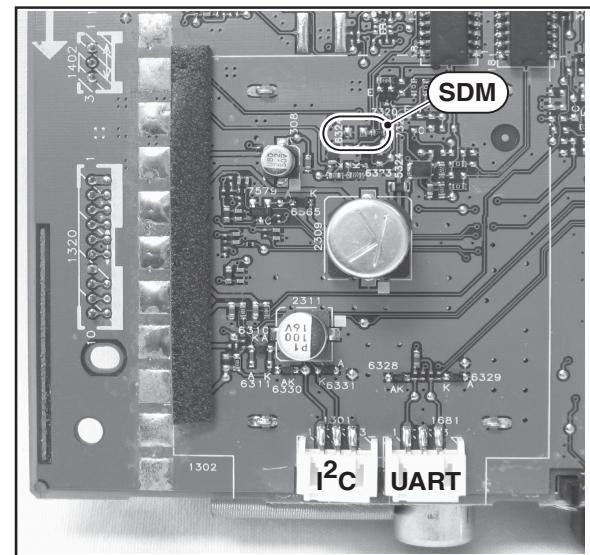
To enter SDM, use one of the following methods:

- Press the following key sequence on the remote control transmitter: "062596" directly followed by the MENU button

(do not allow the OSD display to time out between entries while keying the sequence).

- Short SDM jumper (item 4022, see Figure "Service jumper") on the TV board and apply AC Power. Remove the short after start-up.

Caution: Entering SDM by shorting "Service" jumpers will override the software protections. Do this only for a short period. **When doing this, the service-technician must know exactly what he is doing, as it could damage the television set.**



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Figure 5-1 SDM Service jumper

After entering SDM, the following screen is visible, with SDM in the upper right corner of the screen to indicate that the television is in Service Default Alignment Mode.

00022 LC42EP1 2.03/S42GV1 2.02 SDM
ERR 0 0 0 0
OP 000 057 140 032 120 128 000

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Figure 5-2 SDM menu (example from LC4.2E)

How to navigate

When you press the MENU button on the remote control, the set will switch on the normal user menu in the SDM mode.

How to exit

Switch the set to STANDBY by pressing the POWER button on the remote control transmitter.

If you turn the television set off by removing the mains (i.e., unplugging the television) or by using the POWER button on the TV set, the television set will remain in SDM when mains is re-applied, and the error buffer is not cleared.

5.2.2 Service Alignment Mode (SAM)

Purpose

- To change option settings.
- To display / clear the error code buffer.
- To perform alignments.

Specifications

- Operation hours counter (maximum five digits displayed).
- Software version, Error codes, and Option settings display.
- Error buffer clearing.
- Option settings.
- Software alignments (Tuner, White Tone, Geometry, and Audio).
- NVM Editor.
- ComPair Mode switching.

How to enter

Press the following key sequence on the remote control transmitter: "062596" directly followed by the OSD/STATUS/ INFO button (do not allow the OSD display to time out between entries while keying the sequence).

After entering SAM, the following screen is visible, with SAM in the upper right corner of the screen to indicate that the television is in Service Alignment Mode.

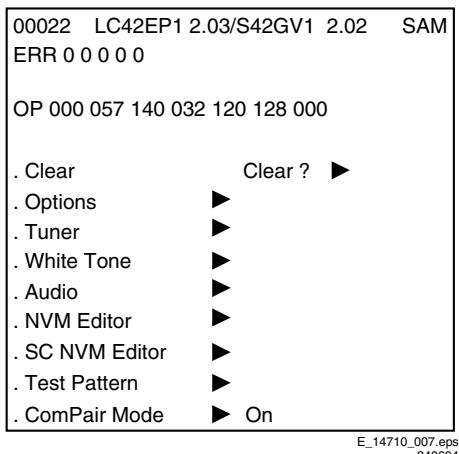


Figure 5-3 SAM menu (example from LC4.2E)

Menu explanation

1. **LLLLL.** This represents the run timer. The run timer counts normal operation hours (including "on/off" switching), but does not count stand-by hours.
2. **AAAABCD-X.YY/EEEEEE_F.GG.** This is the software identification of the Main/Scaler microprocessor:
 - **A**= the chassis name.
 - **B**= the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
 - **C**= the software diversity:
 - **Europe:** T= 1 pg TXT, F= Full TXT, V= Voice ctrl.
 - **LATAM and NAFTA:** N= Stereo non-dBx, S= Stereo dBx.
 - **Asian Pacific:** T= TXT, N= non-TXT, C= NTSC.
 - **ALL regions:** M= mono, D= DVD, Q= Mk2.
 - **D**= the language cluster number.
 - **X**= the Main software version number (updated with a major change that is incompatible with previous versions).
 - **YY**= the sub software version number (updated with a minor change that is compatible with previous versions).
 - **EEEEEE**= the Scaler SW cluster
 - **F**= the Scaler SW version no.
 - **GG**= the sub-version no.
3. **SAM.** Indication of the Service Alignment Mode.

4. **Error Buffer (ERR).** Shows all errors detected since the last time the buffer was erased. Five errors possible.
5. **Option Bytes (OP).** Shows all option settings. See "Options" in the Alignments section for a detailed description. Seven codes are available.
6. **Clear.** Erases the contents of the error buffer. Select the CLEAR menu item and press the CURSOR RIGHT key. The content of the error buffer is cleared.
7. **Options.** Used to set the option bits. See "Options" in the Alignments section for a detailed description.
8. **Tuner.** Used to align the tuner. See "Tuner" in the Alignments section for a detailed description.
9. **White Tone.** Used to align the white tone. See "White Tone" in the Alignments section for a detailed description.
10. **Audio.** No audio alignment is necessary for this television set.
11. **NVM Editor.** Can be used to change the NVM data in the television set.
12. **SC NVM Editor.** Can be used to edit Scaler NVM.
13. **Test Pattern.** For future use.
14. **ComPair.** Can be used to switch the television to "In System Programming" (ISP) mode, for software uploading via ComPair.

Caution: When this mode is selected without ComPair connected, the TV will be blocked. Remove the AC power to reset the TV.

How to navigate

- In SAM, select menu items with the CURSOR UP/DOWN keys on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, use the CURSOR UP/DOWN keys to display the next / previous menu items.
- With the CURSOR LEFT/RIGHT keys, it is possible to:
 - Activate the selected menu item.
 - Change the value of the selected menu item.
 - Activate the selected submenu.
- In SAM, when you press the MENU button twice, the set will switch to the normal user menus (with the SAM mode still active in the background). To return to the SAM menu press the MENU button again.
- When you press the MENU key in while in a submenu, you will return to the previous menu.

How to store SAM settings

To store the settings changed in SAM mode, leave the top level SAM menu by using the POWER button on the remote control transmitter or the television set.

How to exit

Switch the set to STANDBY by pressing the POWER button on the remote control transmitter or on the television set.

5.2.3 Customer Service Mode (CSM)

Purpose

The Customer Service Mode shows error codes and information on the TV's operation settings. The call centre can instruct the customer (by telephone) to enter CSM in order to identify the status of the set. This helps the call centre to diagnose problems and failures in the TV set before making a service call.

The CSM is a read-only mode; therefore, modifications are not possible in this mode.

How to enter

To enter CSM, press the following key sequence on the remote control transmitter: "123654" (do not allow the OSD display to time out between entries while keying the sequence).

Upon entering the Customer Service Mode, the following screen will appear:

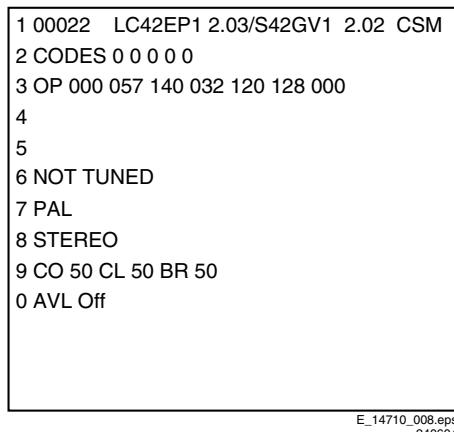


Figure 5-4 CSM menu (example from LC4.2E)

Menu explanation

1. Indication of the decimal value of the operation hours counter, Main/Scaler software version (see "Service Alignment Mode" for an explanation), and service mode (CSM= Customer Service Mode).
2. Displays the last five errors detected in the error code buffer.
3. Displays the option bytes.
4. Displays the type number version of the set (option).
5. Reserved.
6. Indicates the television is receiving an "IDENT" signal on the selected source. If no "IDENT" signal is detected, the display will read "NOT TUNED"
7. Displays the detected Colour system (e.g. PAL/NTSC).
8. Displays the detected Audio (e.g. stereo/mono).
9. Displays the picture setting information.
10. Displays the sound setting information.

How to exit

To exit CSM, use one of the following methods:

- Press the MENU, STATUS (or EXIT/INFO/[i+]), or POWER button on the remote control transmitter.
- Press the POWER button on the television set.

5.3 Problems and Solving Tips Related to CSM

5.3.1 Picture Problems

Note: The problems described below are all related to the TV settings. The procedures used to change the value (or status) of the different settings are described.

Picture too dark or too bright

If:

- The picture improves when you press the AUTO PICTURE button on the remote control transmitter, or
- The picture improves when you enter the Customer Service Mode,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the CURSOR UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the CURSOR LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the CURSOR UP/DOWN keys (if necessary) to select BRIGHTNESS.

6. Press the CURSOR LEFT/RIGHT keys to increase or decrease the BRIGHTNESS value.
7. Use the CURSOR UP/DOWN keys to select PICTURE.
8. Press the CURSOR LEFT/RIGHT keys to increase or decrease the PICTURE value.
9. Press the MENU button on the remote control transmitter twice to exit the user menu.
10. The new PERSONAL preference values are automatically stored.

White line(s) around picture elements and text

If:

The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the CURSOR UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the CURSOR LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the CURSOR UP/DOWN keys to select SHARPNESS.
6. Press the CURSOR LEFT key to decrease the SHARPNESS value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Snowy picture

Check CSM line 6. If this line reads "Not Tuned", check the following:

- Antenna not connected. Connect the antenna.
- No antenna signal or bad antenna signal. Connect a proper antenna signal.
- The tuner is faulty (in this case line 2, the Error Buffer line, will contain error number 10). Check the tuner and replace/repair the tuner if necessary.

Black and white picture

If:

- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the CURSOR UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the CURSOR LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the CURSOR UP/DOWN keys to select COLOUR.
6. Press the CURSOR RIGHT key to increase the COLOUR value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Menu text not sharp enough*If:*

- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the CURSOR UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the CURSOR LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the CURSOR UP/DOWN keys to select PICTURE.
6. Press the CURSOR LEFT key to decrease the PICTURE value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

5.4 ComPair**5.4.1 Introduction**

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I²C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I²C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the Force/SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial (or RS232) cable.

For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector(s).

The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- Automatic (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C/UART level. ComPair can access the I²C/UART bus of the television. ComPair can send and receive I²C/UART commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I²C/UART buses of the TV-set.
- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through

the fault finding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point I7 and click on the correct oscilloscope you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the fault finding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:

- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the (European) Dealer Service Tool (DST).
- If both ComPair and Force/SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink.

Example: *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Mono-carrier.*

- Click on the “Panel” hyperlink to automatically show the PWB with a highlighted capacitor C2568.
- Click on the “Schematic” hyperlink to automatically show the position of the highlighted capacitor.

5.4.3 How To Connect

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with “PC”) of the ComPair interface.
3. Connect the mains adapter to the supply connector (marked with “POWER 9V DC”) of the ComPair interface.
4. Switch the ComPair interface “OFF”.
5. Switch the television set “OFF” with the POWER switch.
6. Connect the ComPair I²C/UART interface cable between the connector on the rear side of the ComPair interface (marked with “I²C” or for UART on the connector marked “VCR”) and the appropriate ComPair connector at the rear side of the TV (I²C or UART).

Note: Some chassis need an additional I²C extension cable due to a different connector pitch!

7. Plug the mains adapter in a mains outlet, and switch the interface “ON”. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the “Introduction” chapter.

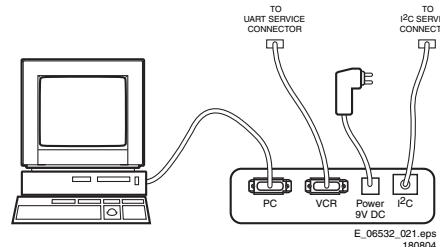


Figure 5-5 ComPair Interface connection

5.4.4 How To Order

ComPair order codes (EU/AP/LATAM):

- Starter kit ComPair32/SearchMan32 software and ComPair interface (excl. transformer): 3122 785 90450.
- ComPair interface (excluding transformer): 4822 727 21631.
- Starter kit ComPair32 software (registration version): 3122 785 60040.

- Starter kit SearchMan32 software: 3122 785 60050.
- ComPair32 CD (update): 3122 785 60070 (year 2002, 3122 785 60110 (year 2003).
- SearchMan32 CD (update): 3122 785 60080 (year 2002), 3122 785 60120 (year 2003), 3122 785 60130 (year 2004).
- ComPair I²C interface cable: 3122 785 90004.
- ComPair firmware upgrade IC: 3122 785 90510.
- Transformer (non-UK): 4822 727 21632.
- Transformer (UK): 4822 727 21633.
- ComPair I²C extension cable: 3139 131 03791.
- ComPair UART interface cable: 3122 785 90630.

Note: If you encounter any problems, contact your local support desk.

5.5 Error Codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is displayed at the left side and all other errors shift one position to the right.

5.5.1 How To Read The Error Buffer

You can read the error buffer in 3 ways:

- On screen via the SAM (if you have a picture).
- Examples:**
 - ERROR: 0 0 0 0: No errors detected
 - ERROR: 6 0 0 0: Error code 6 is the last and only detected error
 - ERROR: 9 6 0 0: Error code 6 was detected first and error code 9 is the last detected (newest) error
- Via the blinking LED procedure (when you have no picture). See "The Blinking LED Procedure".
- Via ComPair.

5.5.2 How To Clear The Error Buffer

The error code buffer is cleared in the following cases:

- By using the CLEAR command in the SAM menu:
 - To enter SAM, press the following key sequence on the remote control transmitter: "062596" directly followed by the OSD/STATUS button (do not allow the OSD display to time out between entries while keying the sequence).
 - Make sure the menu item CLEAR is highlighted. Use the CURSOR UP/DOWN buttons, if necessary.
 - Press the CURSOR RIGHT button to clear the error buffer. The text on the right side of the "CLEAR" line will change from "CLEAR?" to "Cleared".
- If an error does not reoccur within 50 hours it is deleted from the error buffer.

5.5.3 Error Codes

In case of non-intermittent faults, write down the errors present in the error buffer and clear the error buffer before you begin the repair. This ensures that old error codes are no longer present.

If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error and not the actual cause of the problem (for example, a fault in the protection detection circuitry can also lead to a protection).

Table 5-1 Error code overview

Error	Device	Error description	Check item	Diagram
0	Not applicable	-	-	-
1	Not applicable	-	-	-
2	Not applicable	-	-	-
3	Not applicable	-	-	-
4	GM1501 Scaler Flash-ROM	I ² C error while communicating with the Genesis Scaler and/or Flash-ROM is faulty/empty	7401 7530	A7 A11
5	Not applicable	+5V protection	7930	A6
6	I ² C bus	General I ² C error	7011, 3088, 3096	A2
7	Not applicable	-	-	-
8	M24C32	I ² C error while communicating with the Scaler EEPROM	7531	A11
9	M24C16	I ² C error while communicating with the EEPROM	7099	A2
10	Tuner	I ² C error while communicating with the PLL tuner	1302, 3302, 3303, 3327	A1
11	Not applicable	-	-	-
12	Not applicable	-	-	-
13	Not applicable	-	-	-
14	K4D263238M	Read-write error with the Scaler SDRAM	7501	A10
15	TDA9178T/N1	I ² C error while communicating with Histogram	7560	A3
16	TDA9178T/N1	I ² C error while communicating with EPLD on Pixel Plus panel	7560	A3

5.6 The Blinking LED Procedure

Using this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDM is entered, the front LED will blink the contents of the error-buffer:

- The Led blinks with as many pulses as the error code number, followed by a time period of 1.5 seconds, in which the Led is off.
- Then this sequence starts is repeated.

Any RC5 command terminates this sequence.

Example of error buffer: **12 9 6 0 0**

After entering SDM, the following occurs:

- 1 long blink of 5 seconds to start the sequence,
- 12 short blinks followed by a pause of 1.5 seconds,
- 9 short blinks followed by a pause of 1.5 seconds,
- 6 short blinks followed by a pause of 1.5 seconds,
- 1 long blink of 1.5 seconds to finish the sequence,
- The sequence starts again at 12 short blinks.

5.7 Fault Finding and Repair Tips

Notes:

- It is assumed that the components are mounted correctly with correct values and no bad solder joints.
- Before any fault finding actions, check if the correct options are set.

5.7.1 NVM Editor

In some cases, it can be handy if one directly can change the NVM contents. This can be done with the “NVM Editor” in SAM mode. With this option, single bytes can be changed.

	Hex	Dec	Description
.ADR	0x000A	10	Existing value
.VAL	0x0000	0	New value
.Store	Store ?		

5.7.2 Load default NVM values

In case a blank NVM is placed or when the NVM content is corrupted, default values can be downloaded into the NVM. After the default values are downloaded it will be possible to start up and to start aligning the TV set. This is no longer initiated automatically; to initiate the download the following action has to be performed:

1. Switch the TV set “off” via the AC Power switch.
2. Short circuit the SDM jumpers (keep short-circuited).
3. Press P+ or Ch+ on the local keyboard (and keep it pressed).
4. Switch the TV set “on” via the AC Power switch.
5. When the set has started, the P+/Ch+ button can be released and the short circuit of the SDM jumpers can be removed.
6. The red LED will be on continuously to indicate that the download is initiated (normally when SDM is activated the red LED will start with the Blinking LED sequence).
7. Wait +/- 30 s (time needed to download default values to the NVM).

5.7.3 Tuner and IF

No Picture in RF mode

1. Check whether picture is present in EXT. If not, go to Video processing troubleshooting section.
2. If present, check that the Option settings are correct.
3. Check that all supply voltages are present.
4. Check if I²C lines are working correctly (3.3V).
5. Manually store a known channel and check if there is IF output at Tuner pin 11.
6. Feed in 105 dBuV at Tuner pin 11 and check whether there is RGB output from Video Processing IC. If yes, Tuner may be defect. Replace Tuner.

Required system is not selected correctly

1. Check whether a Service jumper (#4022, 0805 size) is present. If yes, remove it.

5.7.4 Video Processing

No power

1. Check +12 V and 3V3 at position 1910.
2. If no supply, check the connector 1910.
3. If it is correct, check the power supply board.

Power supply is correct but no green LED

1. Check if connectors 1005 and 1601 are properly inserted.
2. If yes, check if the 3V3 is present.

No picture display

1. Check the RGB signal.
2. If it is present, check 3-IC7016 (NE555).
3. If it has output, the problem is in SCALER part.
4. Otherwise, check H-out on pin 2 of NE555. If the input signal of pin2 is present, but no output, the IC is defect.

Note:

- If the H-out (pin 67) doesn't have signal or the level is low, check the output of NE555 (pin 3) during start up.

- If the H-out (pin 67) has a signal (or has a signal for a very short time), change IC7016 (NE555).

No TV but PC is present

1. Check if HSYNC and VSYNC are present at pin 3 of 7017 and 7015.
2. If they are present, check RGB output.
3. If there is no RGB output, the IC TDA120xx can be defect.

Comb Filter not working

Check Option Byte 5 in SAM (see also chapter 8 “Alignments”).

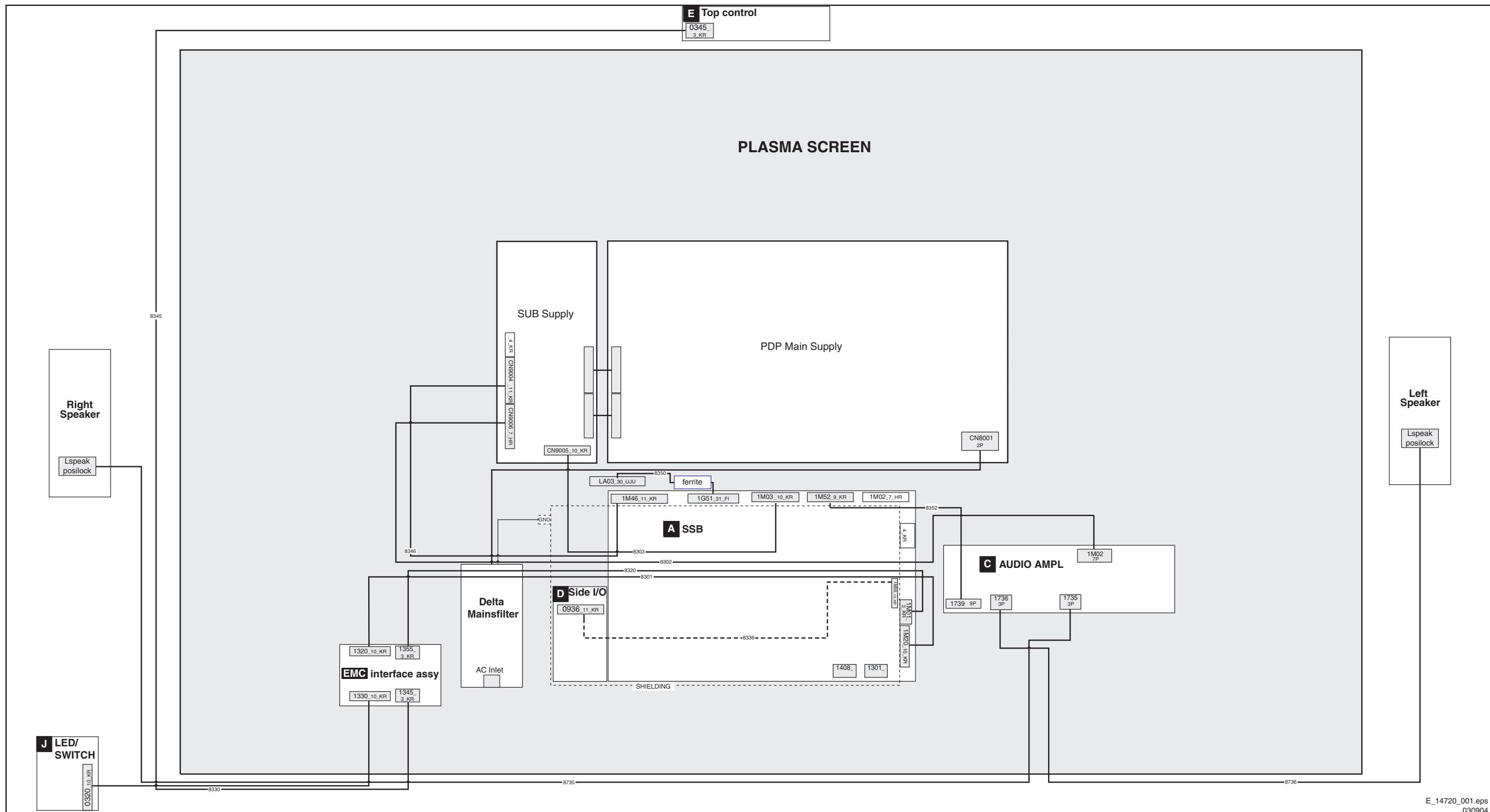
5.7.5 Power Supply

This power supply is for Service a “black box”. When defective, (this can be traced by error-codes in the error buffer, or by strange phenomena), a new panel must be ordered and after receipt, the defective panel must be send in for repair.

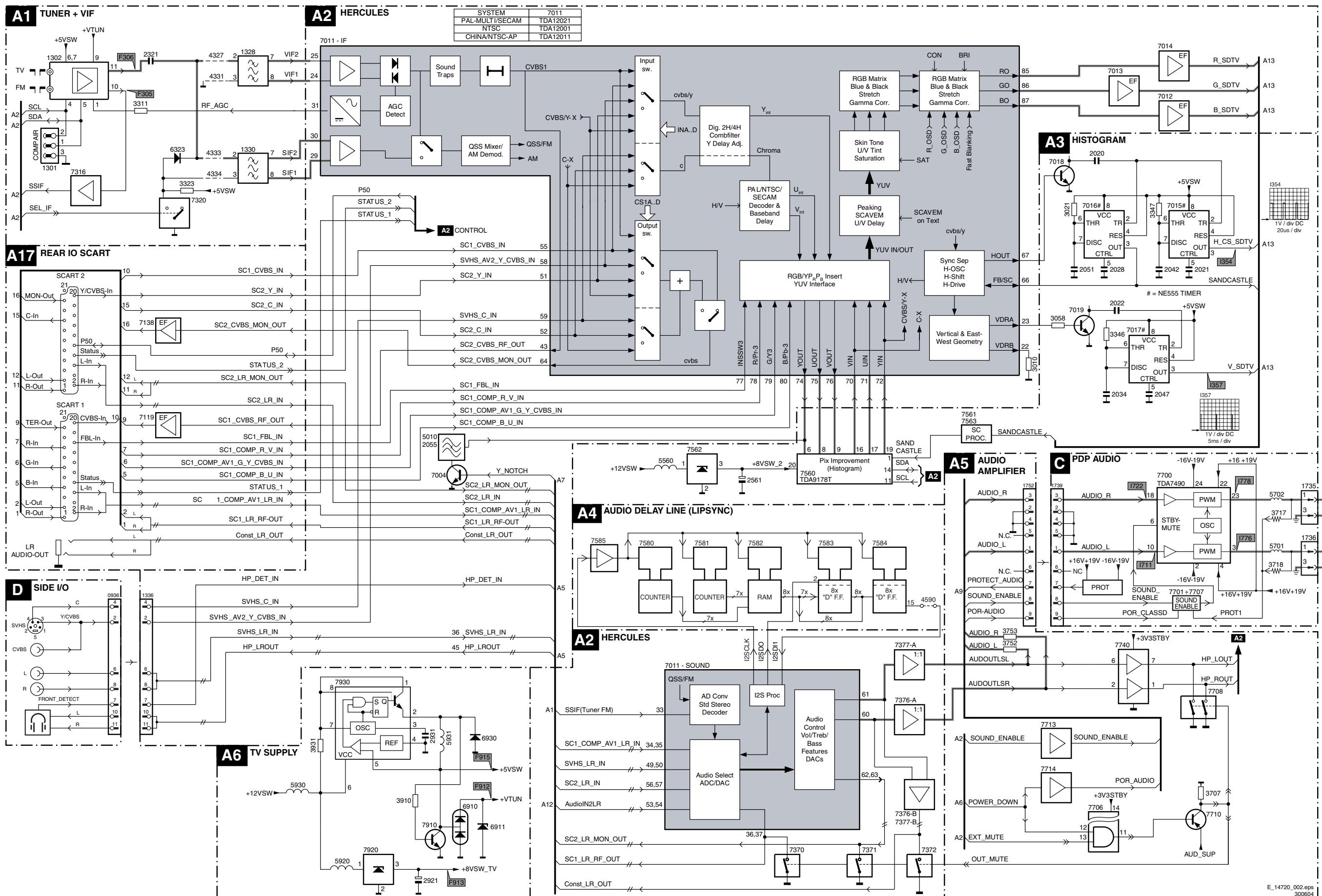
For some basic voltage-measurements, you can use the block diagram(s) in Chapter 6.

6. Block Diagrams, Testpoint Overviews, and Waveforms

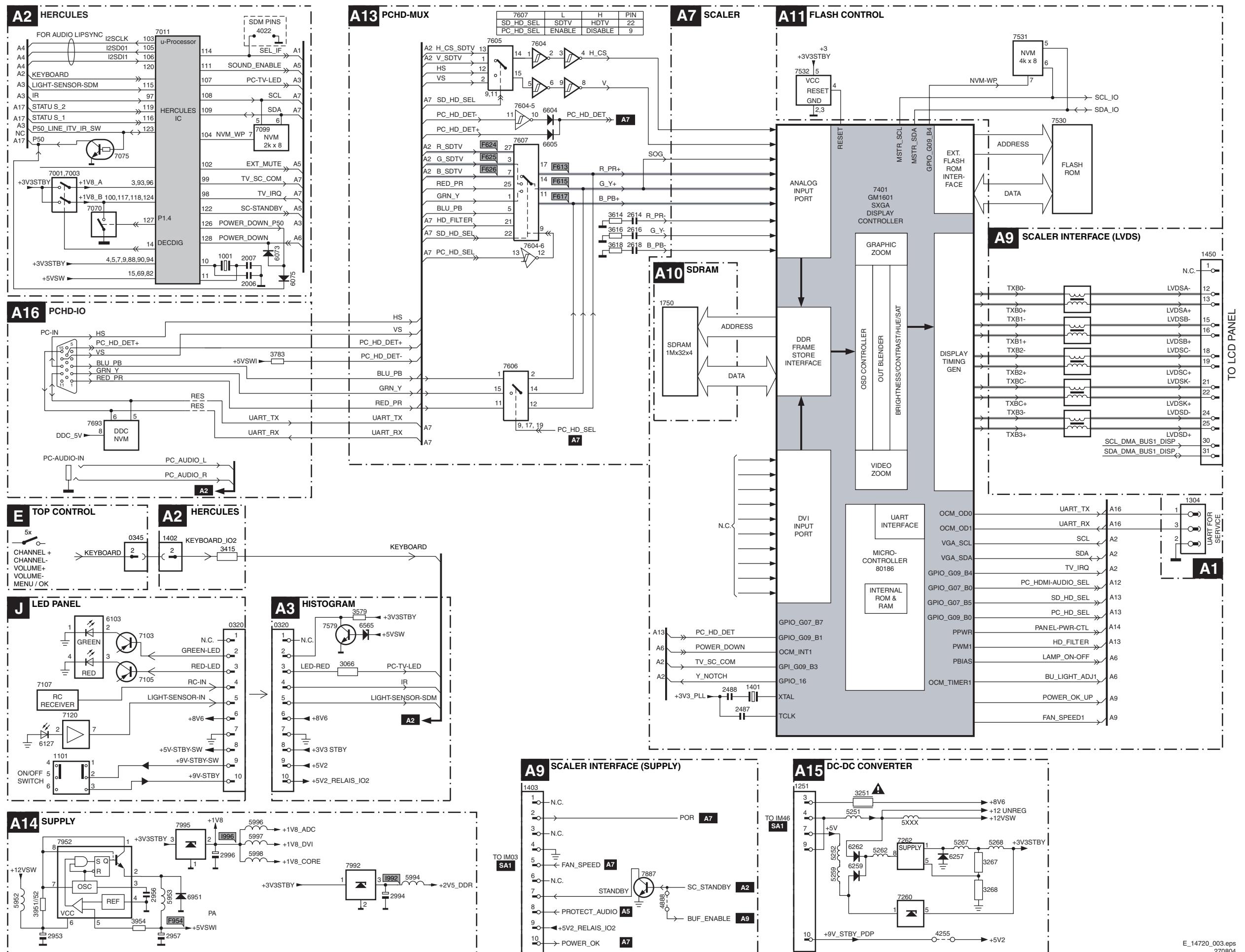
Wiring Diagram



Block Diagram Audio and Video

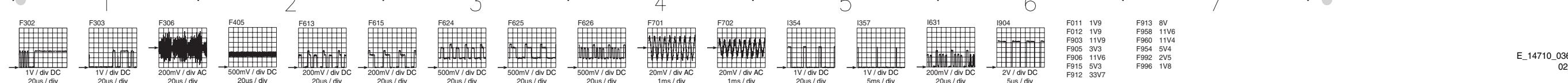
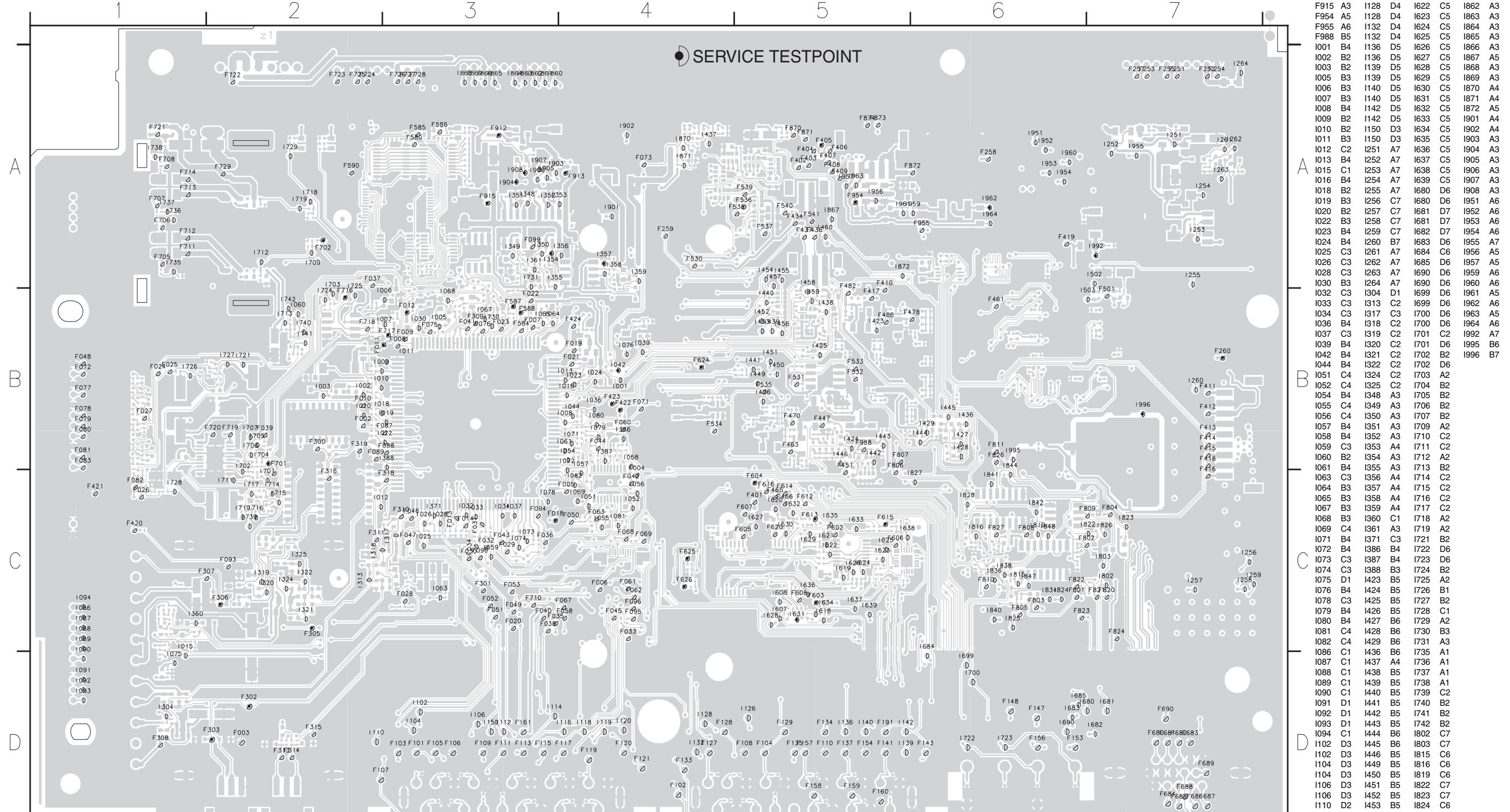


Block Diagram Audio and Video



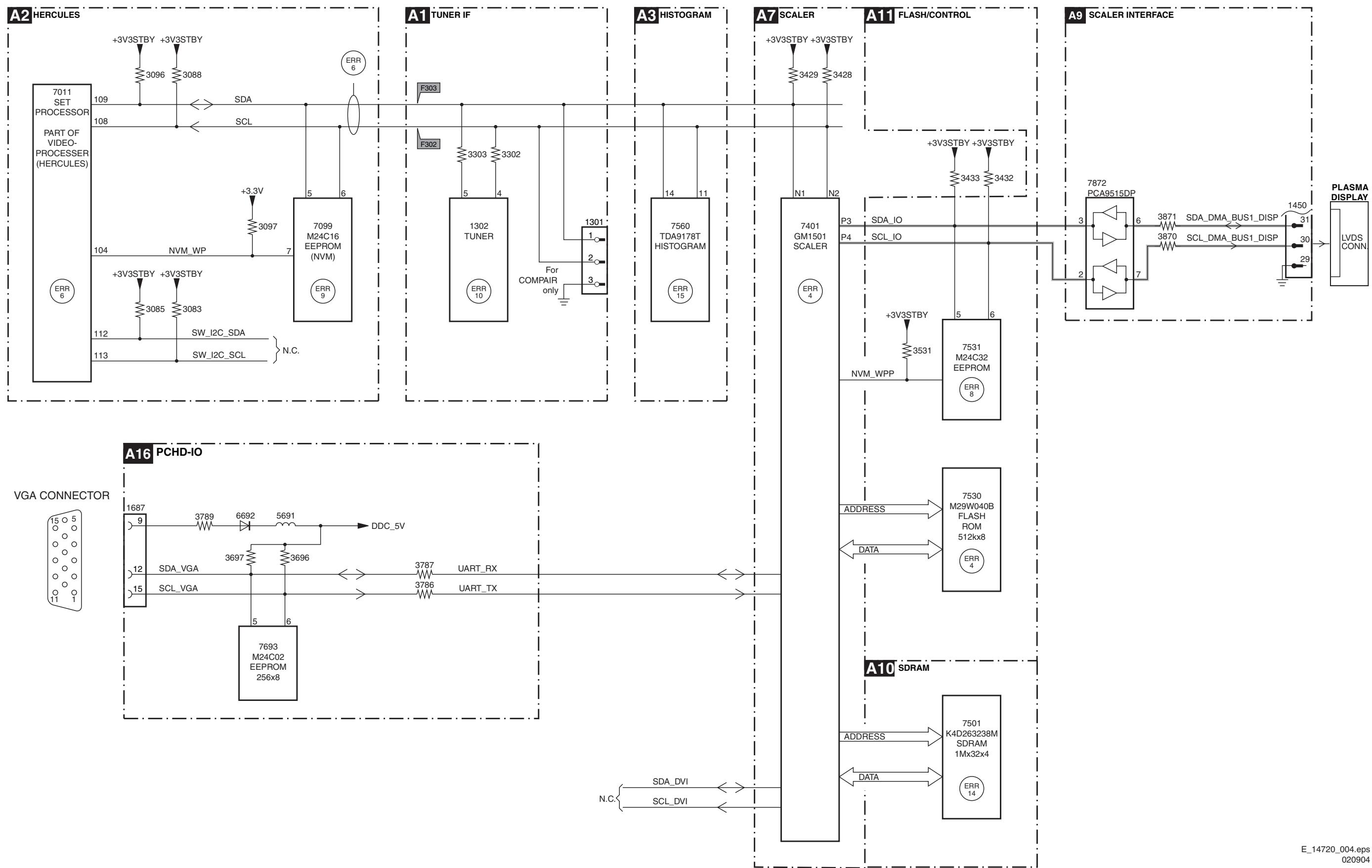
Testpoint Overview SSB (Top Side)

F002	B2	F014	C3	F029	C3	F041	B3	F053	C3	F075	B3	F090	C3	F104	D5	F110	D5	F120	D4	F134	D5	F148	D6	F159	D5	F255	A7	F307	C2	F401	C5	F413	B7	F434	A5	F486	B5	F540	A5	F605	C5	F626	C4	F685	D7	F702	A2	F718	B2	F801	C6	F821	C7	I112	D3	I456	B5	I827	C6
F003	D2	F018	C3	F030	C3	F042	C4	F058	C4	F076	B3	F093	C2	F104	D5	F110	D5	F120	D4	F134	D5	F148	D6	F159	D5	F257	A7	F308	D1	F402	A5	F414	B7	F436	A5	F501	B7	F541	A5	F606	C5	F680	D7	F705	A1	F719	B2	F802	C7	F822	C6	I114	D3	I457	A5	I828	C6		
F004	B4	F019	B4	F031	C3	F043	C3	F060	B4	F077	C3	F094	C3	F105	D3	F111	D3	F121	D4	F135	D5	F153	D6	F160	D5	F258	A6	F309	B3	F403	A5	F415	B7	F437	A5	F530	A4	F580	A3	F607	C5	F686	D7	F706	A1	F719	B2	F803	C6	F823	C6	I114	D3	I458	A5	I834	C6		
F005	C4	F020	C3	F032	C3	F044	B4	F078	B1	F095	C4	F105	D3	F111	D3	F121	D4	F134	D5	F153	D6	F160	D5	F259	A4	F310	C3	F404	A5	F416	B7	F447	B5	F531	B5	F584	B3	F608	C5	F681	D7	F687	D7	F707	A1	F721	A1	F804	C7	F824	C7	I116	D4	I459	B5	I836	C6		
F006	C4	F021	B4	F033	C4	F045	C4	F062	C4	F079	B1	F096	C4	F106	D3	F113	D3	F127	D4	F137	D5	F154	D5	F161	D3	F260	B7	F311	C2	F405	A5	F417	B5	F451	B5	F532	B5	F585	A3	F612	C5	F681	D7	F687	D7	F708	A1	F722	A2	F805	C6	F826	B6	I116	D4	I460	A5	I838	C6
F007	B3	F022	B3	F034	C3	F046	C3	F063	C4	F080	B1	F099	A3	F106	D3	F113	D3	F127	D4	F137	D5	F154	D5	F161	D3	F300	B2	F313	D2	F406	A5	F418	B7	F461	B6	F533	B5	F586	A3	F613	C5	F682	D7	F710	C3	F723	A2	F806	B5	F827	C6	I118	D4	I502	A7	I840	C6		
F008	B3	F023	B3	F035	C3	F047	B4	F067	C4	F081	B1	F101	D3	F107	D2	F115	D3	F128	D4	F141	D5	F156	D6	F191	D5	F301	C3	F314	D2	F402	D2	F415	C5	F465	C5	F535	B5	F588	B3	F615	C5	F683	D7	F689	D7	F712	A1	F725	A2	F808	C6	F821	C7	I119	D4	I607	C5	I842	C6
F009	B3	F024	B1	F036	C3	F048	B1	F068	C4	F082	C1	F101	D3	F107	D2	F115	D3	F128	D4	F141	D5	F156	D6	F191	D5	F302	D2	F315	D2	F408	A5	F420	C1	F466	C5	F536	A5	F590	A2	F616	C5	F683	D7	F689	D7	F713	A1	F726	A3	F809	C7	F822	A6	I118	D4	I503	B7	I841	C6
F010	B2	F025	B1	F037	A2	F049	C3	F069	C4	F083	B1	F102	D4	F108	D5	F117	D4	F129	D5	F143	D6	F157	D5	F251	A7	F303	D2	F316	C2	F410	A5	F422	B4	F470	B5	F537	A5	F602	C5	F620	C5	F684	D7	F690	D7	F714	A1	F727	A3	F810	C6	F824	A5	I120	D4	I618	C5	I847	C6
F011	B2	F026	C1	F038	C3	F050	C4	F071	B4	F087	B3	F102	D4	F108	D5	F117	D4	F129	D5	F143	D6	F157	D5	F252	A7	F305	C2	F316	C2	F411	B7	F478	B6	F538	A5	F603	C5	F624	B6	F684	D7	F690	D7	F716	B2	F728	C3	F811	C6	F824	A5	I120	D4	I619	C5	I848	C6		
F012	B3	F027	B1	F039	B2	F051	C3	F072	B1	F088	C3	F103	D3	F119	D4	F133	D4	F147	D6	F158	D5	F254	A7	F306	C2	F319	B2	F412	B7	F424	B4	F482	A5	F539	A5	F604	C5	F625	C4	F685	D7	F701	B2	F717	B3	F729	A2	F820	C7										
F013	C3	F028	C3	F040	C3	F052	C3	F073	A4	F089	B2	F103	D3	F119	D4	F133	D4	F147	D6	F158	D5	F256	A7	F319	B2	F412	B7	F424	B4	F482	A5	F539	A5	F604	C5	F625	C4	F685	D7	F701	B2	F717	B3	F729	A2	F820	C7												

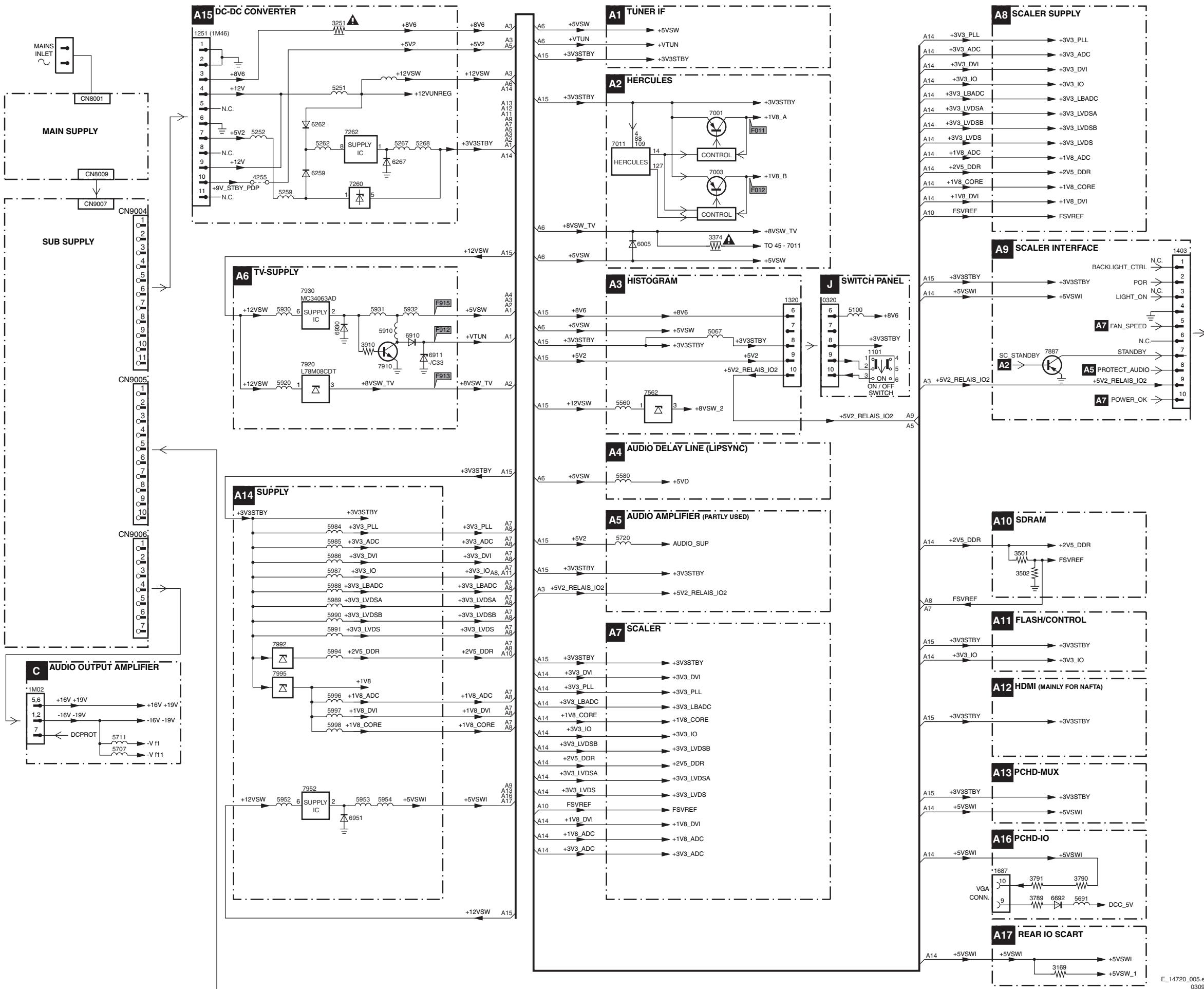


I2C IC Overview

I2C BUS INTERCONNECTION DIAGRAM

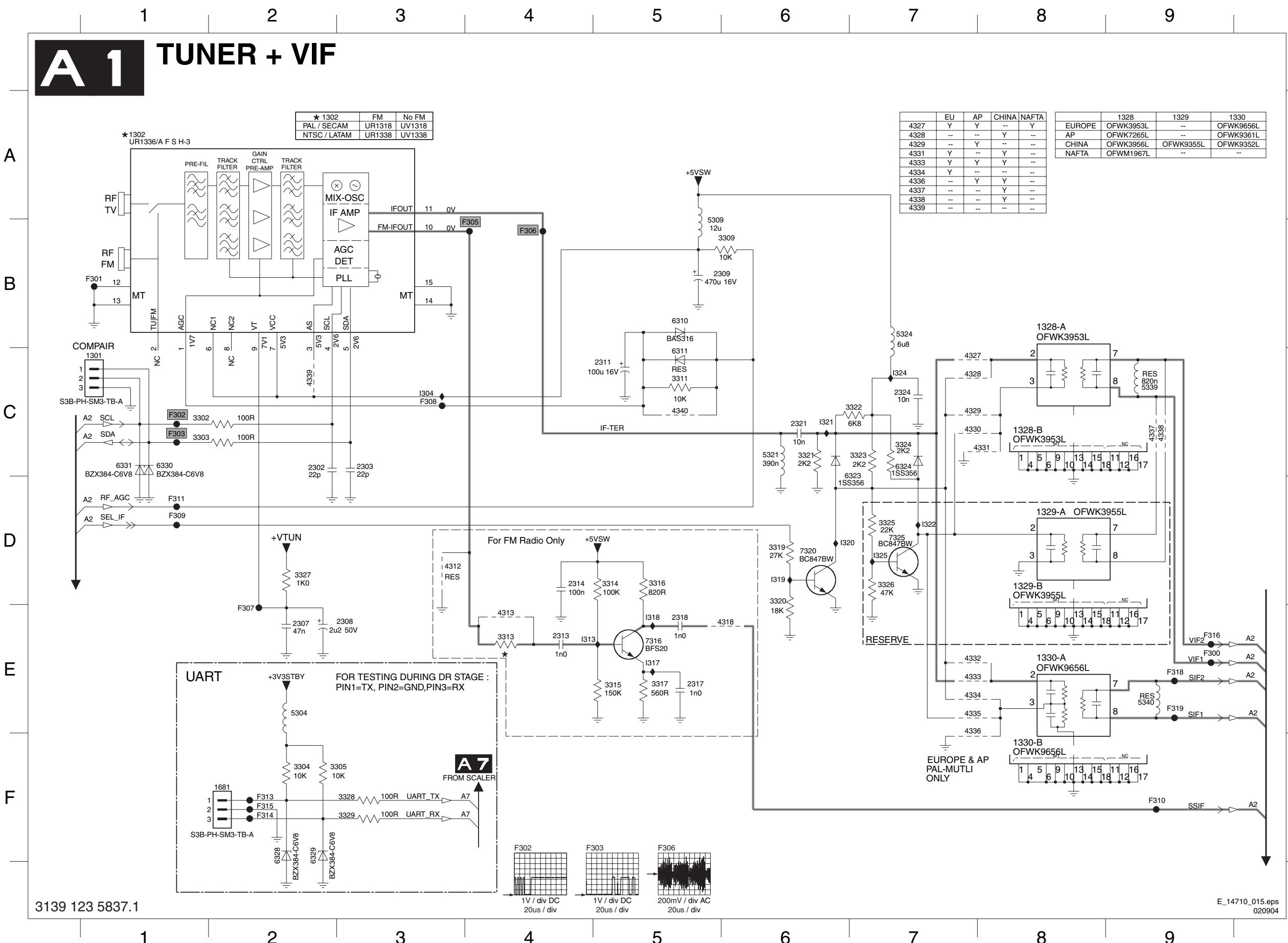


Supply Voltage Overview



7. Circuit Diagrams and PWB Layouts

Small Signal Board: Tuner and VIF



1301 C1	I304 C3
1302 A1	I313 E4
1328-A B8	I317 E5
1328-B C8	I318 E5
1329-A D8	I319 D6
1329-B D8	I320 D6
1330-A E8	I321 C6
1330-B F8	I322 D7
1681 F2	I324 C7
2302 C2	I325 D7

	1328	1329	1330
EUROPE	OFWK3953L	--	OFWK9656L
AP	OFWK7265L	--	OFWK9361L
CHINA	OFWK3956L	OFWK9355L	OFWK9352L
NAFTA	OFWM1967L	--	--

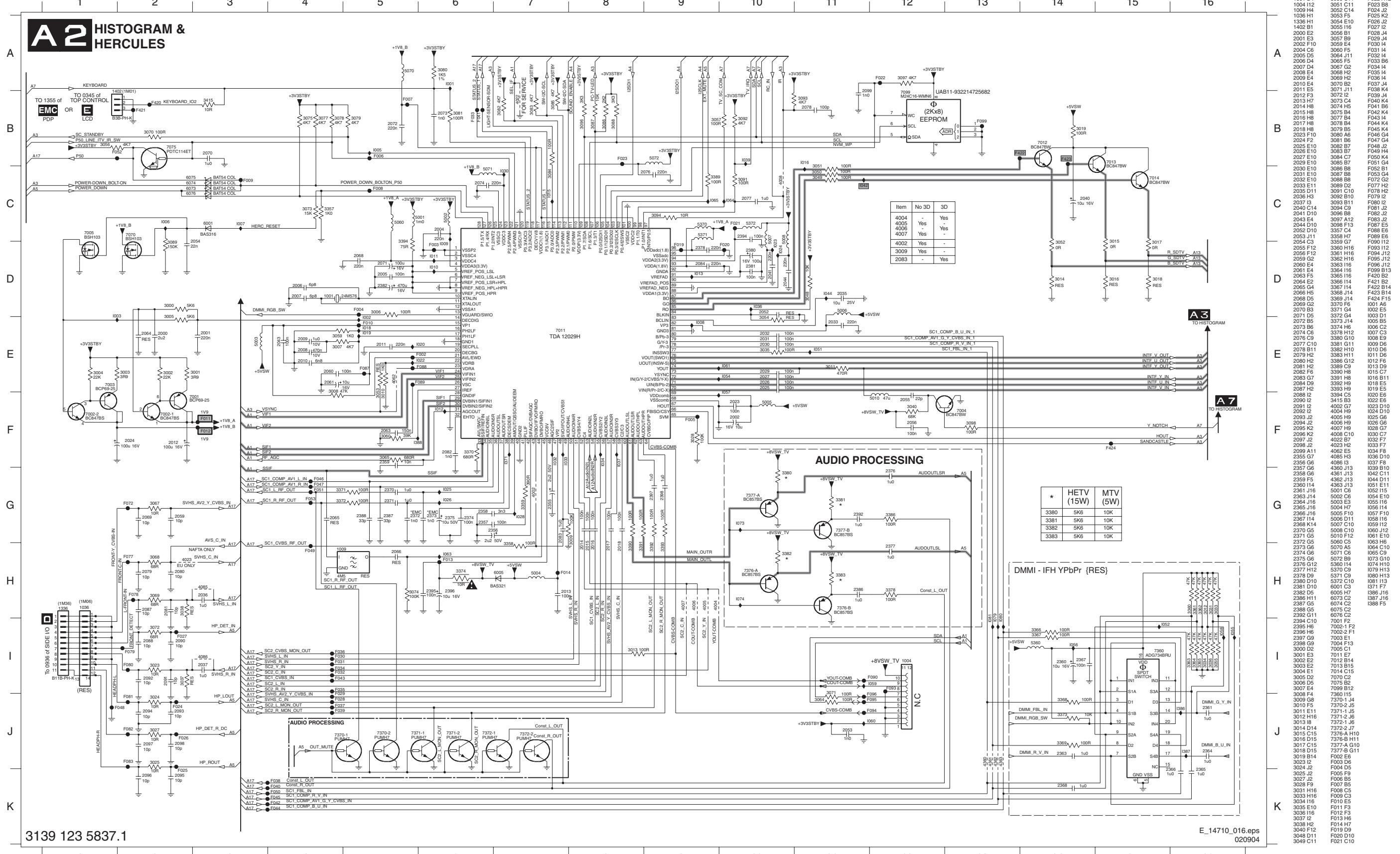
TA
EURO
AP
CHINA
NAFTA

	1328
PE	OFWK3
	OFWK7
A	OFWK3
A	OFWM1

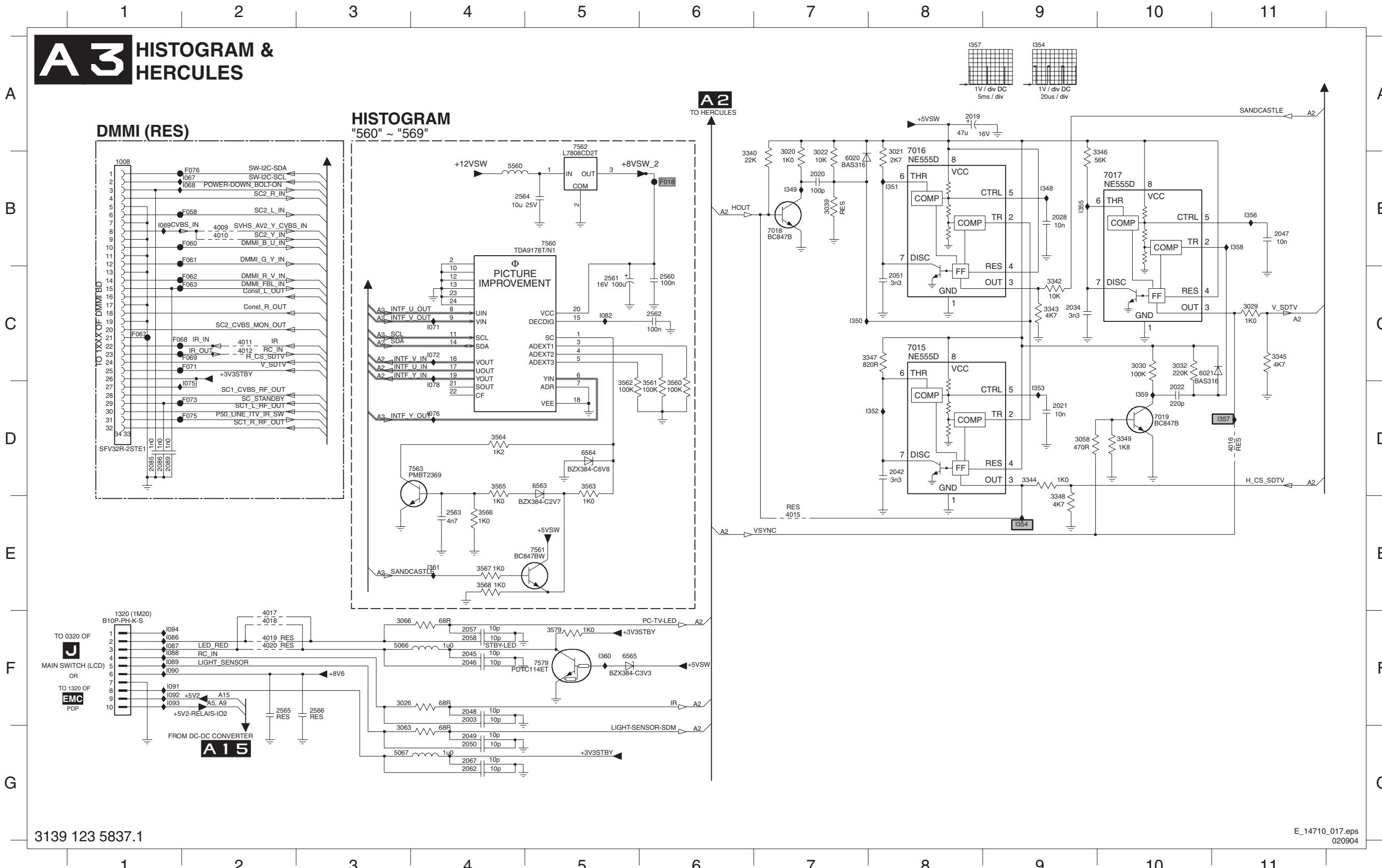
	1329	1330
953L	--	OFWK9656L
965L	--	OFWK9361L
956L	OFWK9355L	OFWK9352L
967L	--	--

—
B
2314 D4
2317 E5
2318 E5
2321 C6
2324 C7
3302 C1
3303 C1
3304 F2
3305 F3
3309 B6
3311 C5
3313 E4
3314 D5
3315 E5
3316 D5
3317 E5
3319 D6
3320 D6
3321 C6
3322 C7
3323 C7
3324 C7
3325 D7
3326 D7
3327 D2
3328 F3
3329 F3
4312 D3
4313 E4
4318 E6
4327 C7
4328 C7
4329 C7
4330 C7
4331 C8
4332 E7
4333 E7
4334 E7
4335 E7
4336 E7
4337 C9
4338 C9
4339 C2
4340 C5
5304 E2
5309 B5
5321 C6
5324 B7
5339 C9
5340 E9
6310 B5
6311 C5
C
6323 D7
6324 C7
6328 F2
6329 F2
6330 C1
6331 C1
7316 E5
7320 D6
7325 D7
F300 E9
F301 B1
F302 C1
F303 C1
F305 B4
F306 B4
F307 E2
F308 C3
F309 D1
F310 F9
F311 D1
F313 F2
F314 F2
F315 F2
F316 E9
F318 E9
F319 E9

Small Signal Board: Histogram and Hercules

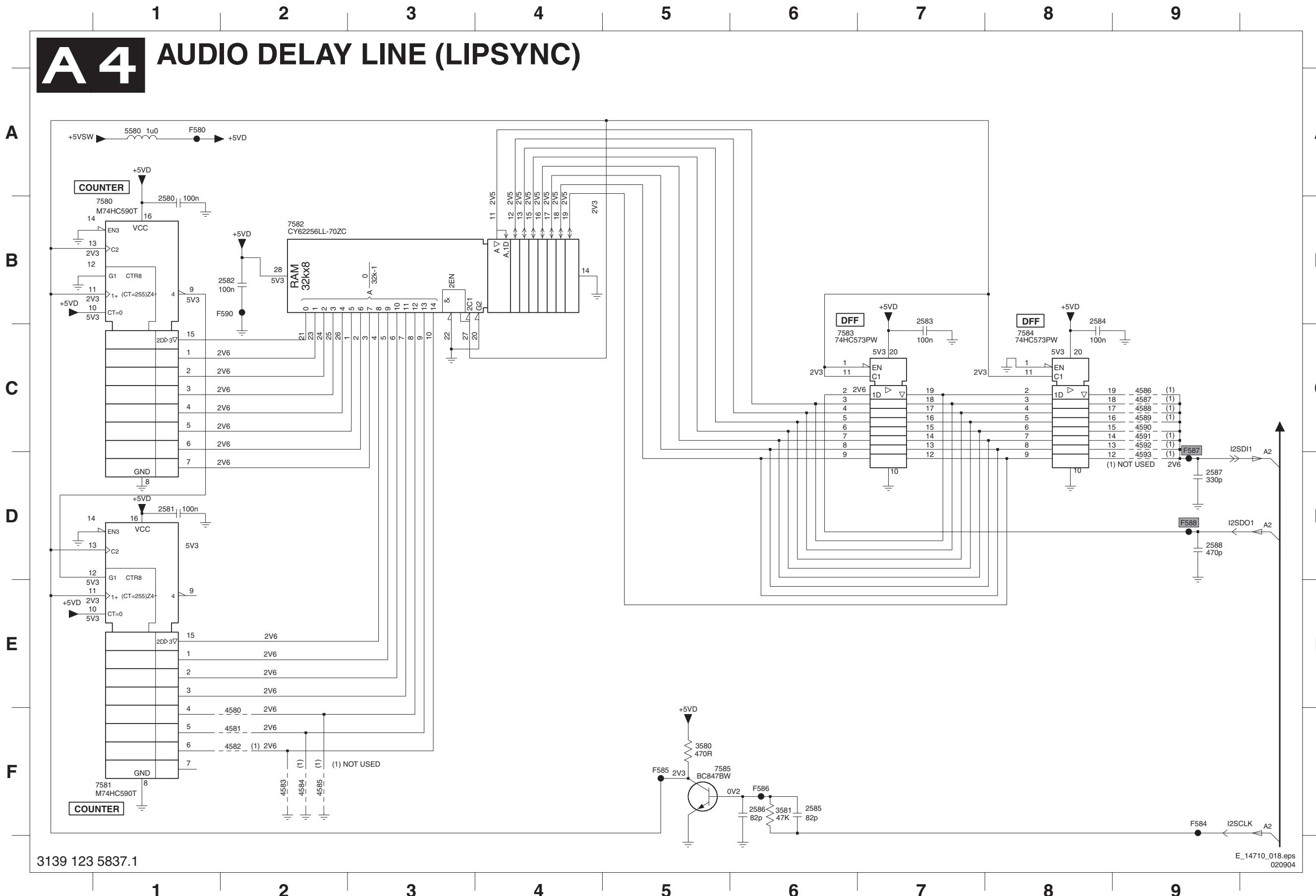


Small Signal Board: Histogram and Hercules



1008 B1	F071 C2
1320 F1	F073 D2
2003 F4	F075 D2
2019 A8	F076 B2
2020 B7	I067 B2
2021 D9	I068 B2
2022 D10	I069 B1
2028 B9	I071 C4
2034 C9	I072 C4
2042 D8	I075 D2
2045 F4	I076 D4
2046 F4	I078 D4
2047 B11	I082 C5
2048 F4	I086 F1
2049 G4	I087 F1
2050 G4	I088 F1
2051 C8	I089 F1
2057 F4	I090 F1
2058 F4	I091 F1
2062 G4	I092 F1
2067 G4	I093 F1
2085 D1	I094 F1
2086 D1	I348 B9
2089 D1	I349 B7
2560 C6	I350 C7
2561 C5	I351 B8
2562 C6	I352 D8
2563 E4	I353 D9
2564 B4	I354 E9
2565 F2	I355 B9
2566 F3	I356 B11
3020 A7	I357 D11
3021 A8	I358 B11
3022 A7	I359 D10
3026 F3	I360 F5
3029 C11	I361 E4
3030 C10	
3032 C10	
3039 B7	
3058 D9	
3063 G3	
3066 F3	
3340 A6	
3342 C9	
3343 C9	
3344 D9	
3345 C11	
3346 A10	
3347 C8	
3348 D9	
3349 D10	
3560 C6	
3561 C6	
3562 C5	
3563 D5	
3564 D4	
3565 D4	
3566 E4	
3567 E4	
3568 E4	
3579 F5	
4009 B2	
4010 B2	
4011 C2	
4012 C2	
4015 E7	
4016 D11	
4017 F2	
4018 F2	
4019 F2	
4020 F2	
5066 F3	
5067 G3	
5560 B4	
6020 B7	
6021 C10	
6563 D5	
6564 D5	
6565 F5	
7015 C8	
7016 B8	
7017 B10	
7018 B7	
7019 D10	
7560 B5	
7561 E5	
7562 A5	
7563 D3	
7579 F5	
F018 B6	
F058 B2	
F061 B2	
F062 C2	
F063 C2	
F066 C1	
F069 C2	

Small Signal Board: Audio Delay line (LIPSYNC)



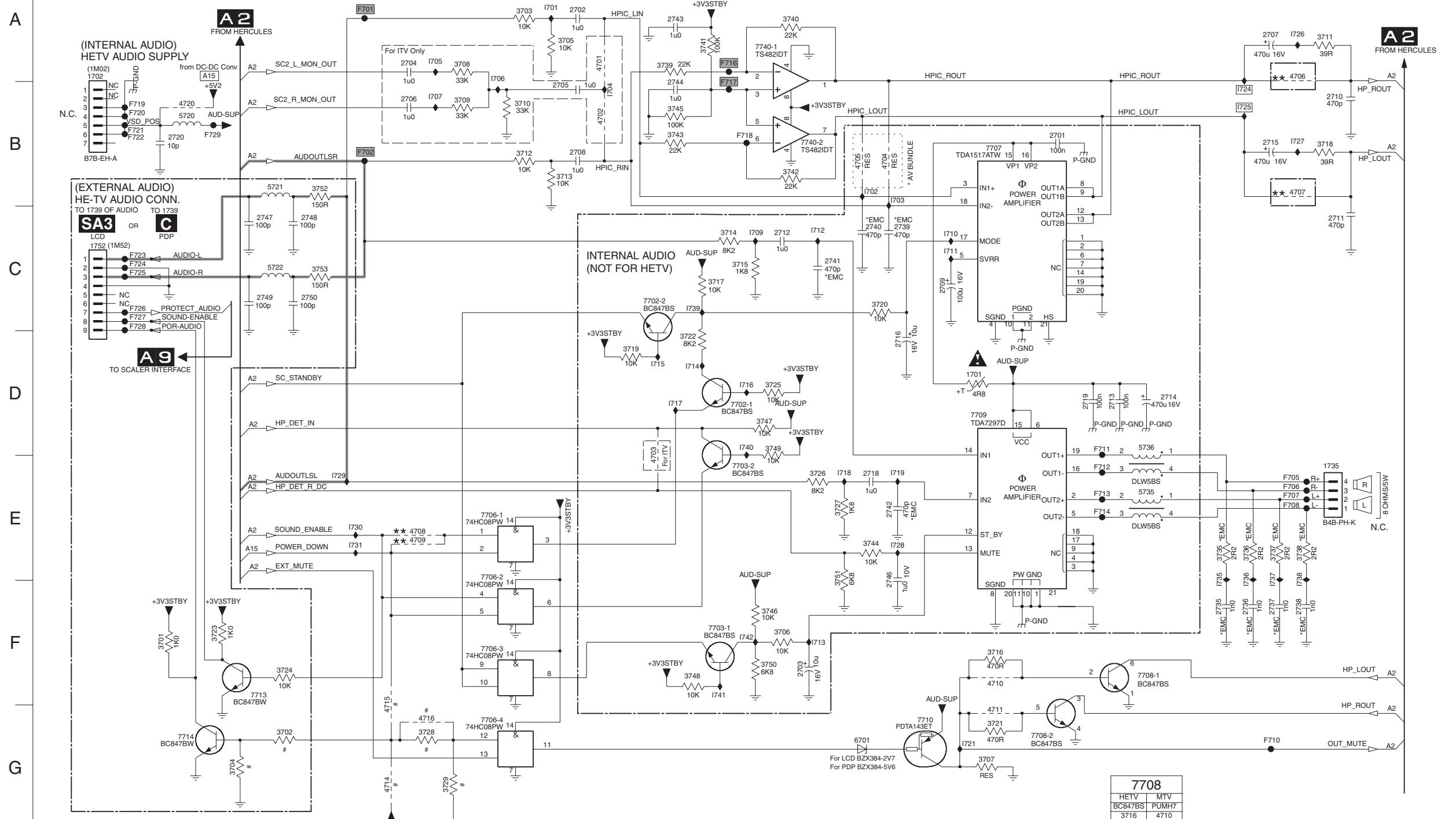
2580 B1
2581 D1
2582 B2
2583 B7
2584 B8
2585 F6
2586 F6
2587 D9
2588 D9
3580 F5
3581 F6
4580 F2
4581 F2
4582 F2
4583 F2
4584 F2
4585 F2
4586 C9
4587 C9
4588 C9
4589 C9
4590 C9
4591 C9
4592 C9
4593 D9
5580 A1
7580 B1
7581 F1
7582 B2
7583 C6
7584 C8
7585 F6
F580 A1
F584 F9
F585 F5
F586 F6
F587 D9
F588 D9
F590 B2

3139 123 5837.1

E_14710_018.eps
020904

Small Signal Board: Audio Amplifier

A 5 AUDIO AMPLIFIER



#	HETV		MTV
	LCD	PDP	
3702	2K2	6K8	10K
3704	470R	1K	-
3728	2K2	5K6	-
3729	3K9	3K3	-
4714	Yes	Yes	No
4715	-	-	Yes
4716	-	-	Yes

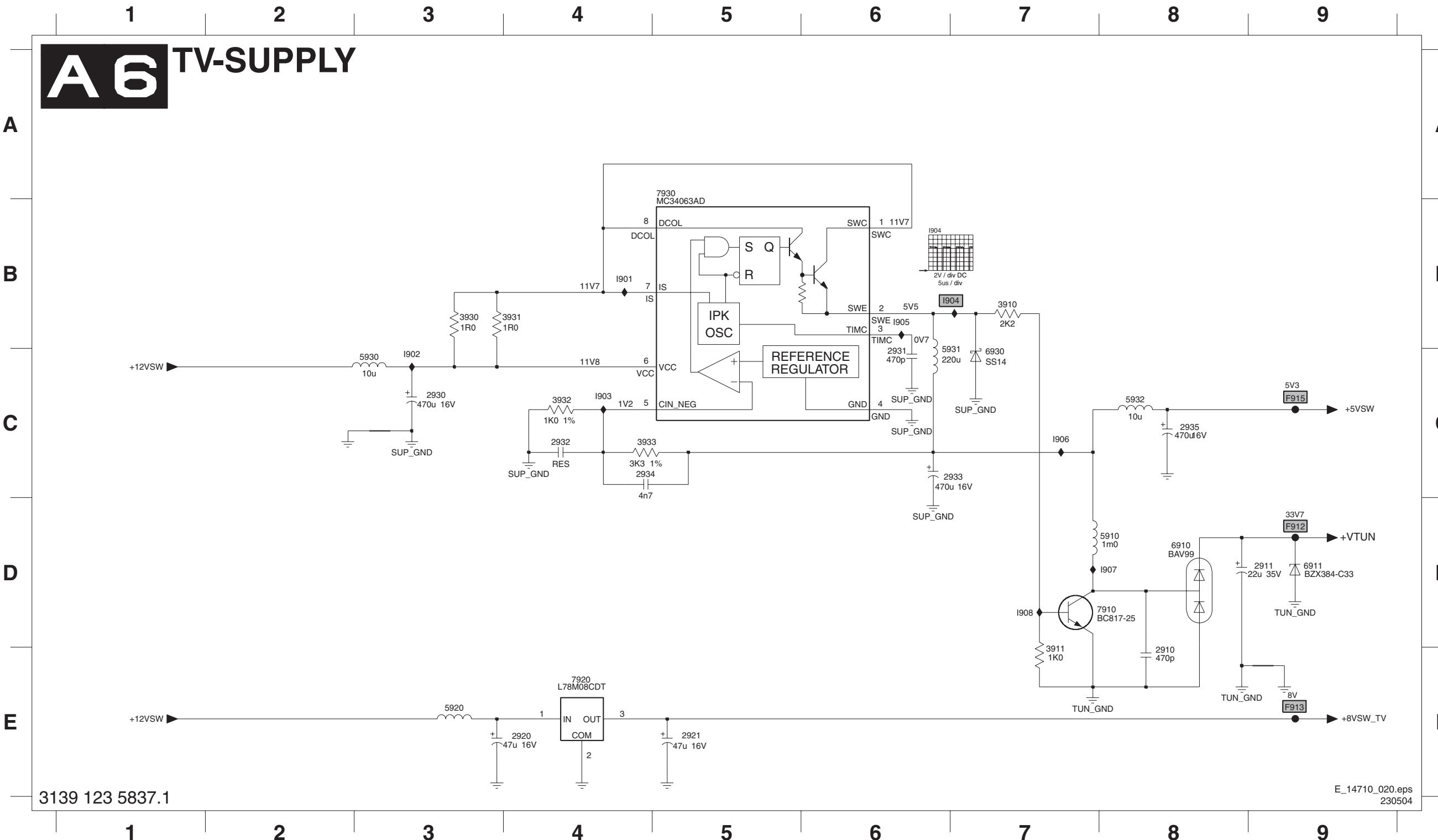
★ *	ITV	MTV		ITV	MTV	★ *
4706	YES	NO		1701	YES	NO
4707	YES	NO		1703	YES	NO
4708	NO	YES		2702	NO	YES
4709	YES	NO		2708	NO	YES
				4701	YES	NO

3W	2 X 5W
2K	8K2
2K	8K2

3139 123 5837.1

E_14710_019.eps
020904

Small Signal Board: TV Supply

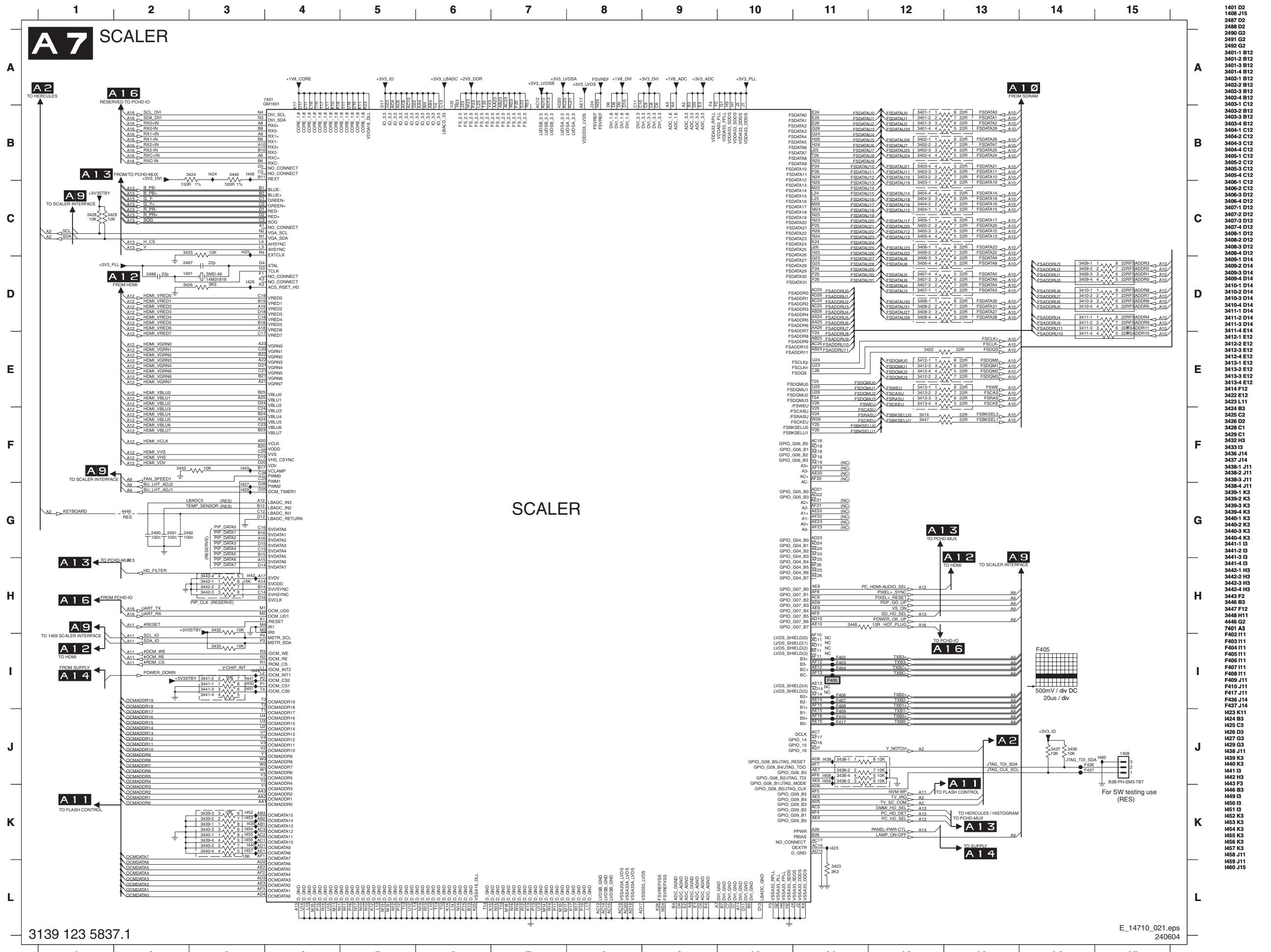


2910 D8
2911 D9
2920 E4
2921 E5
2930 C3
2931 B6
2932 C4
2933 C7
2934 C4
2935 C8
3910 B7
3911 D7
3930 B3
3931 B4
3932 C4
3933 C4
5910 D8
5920 E3
5930 C3
5931 B7
5932 C8
6910 D8
6911 D9
6930 C7
7910 D7
7920 E4
7930 A5
F912 D9
F913 E9
F915 C9
I901 B4
I902 C3
I903 C4
I904 B7
I905 B6
I906 C7
I907 D8
I908 D7

3139 123 5837.1

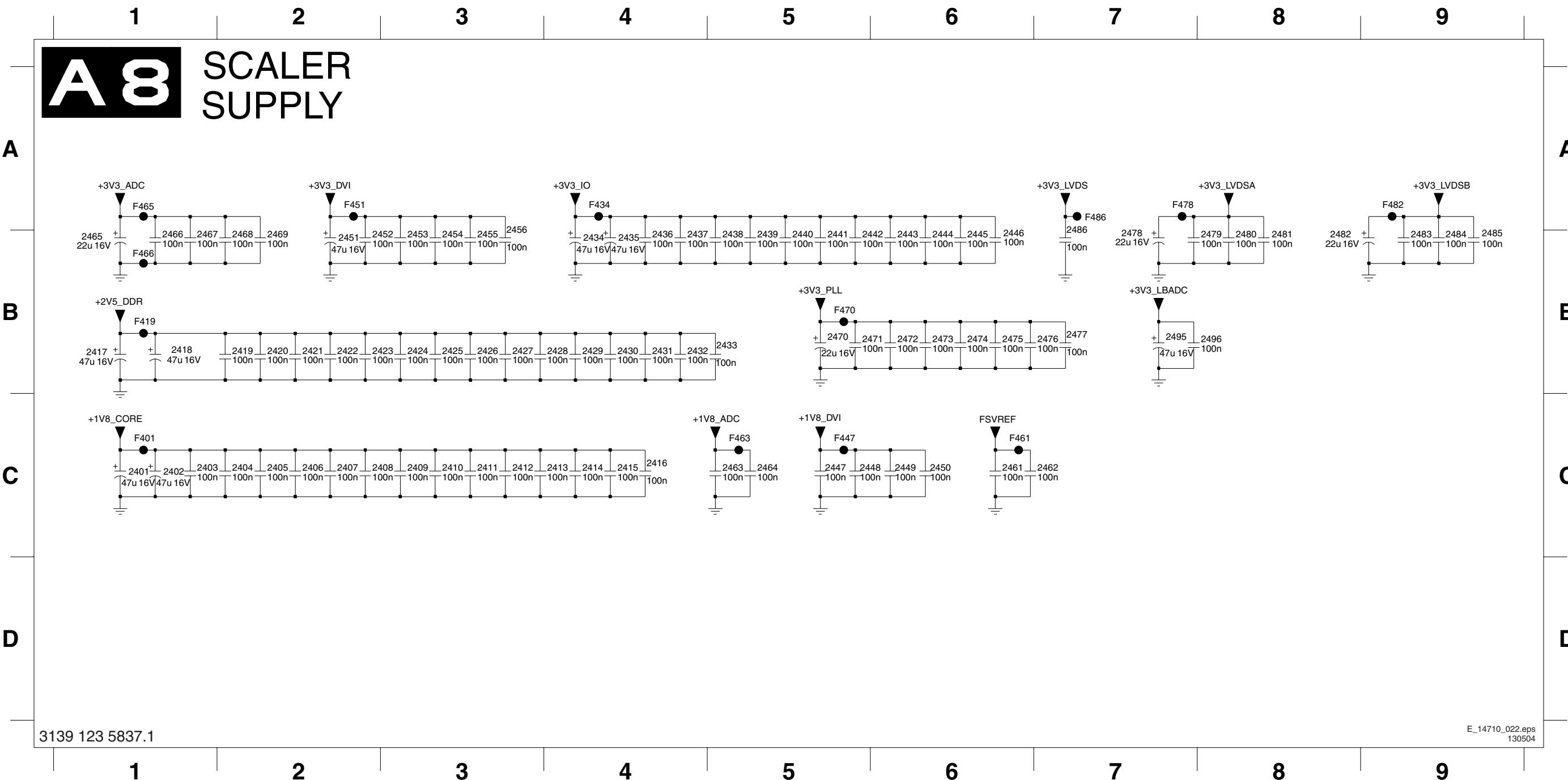
E_14710_020.eps
230504

Small Signal Board: Scaler

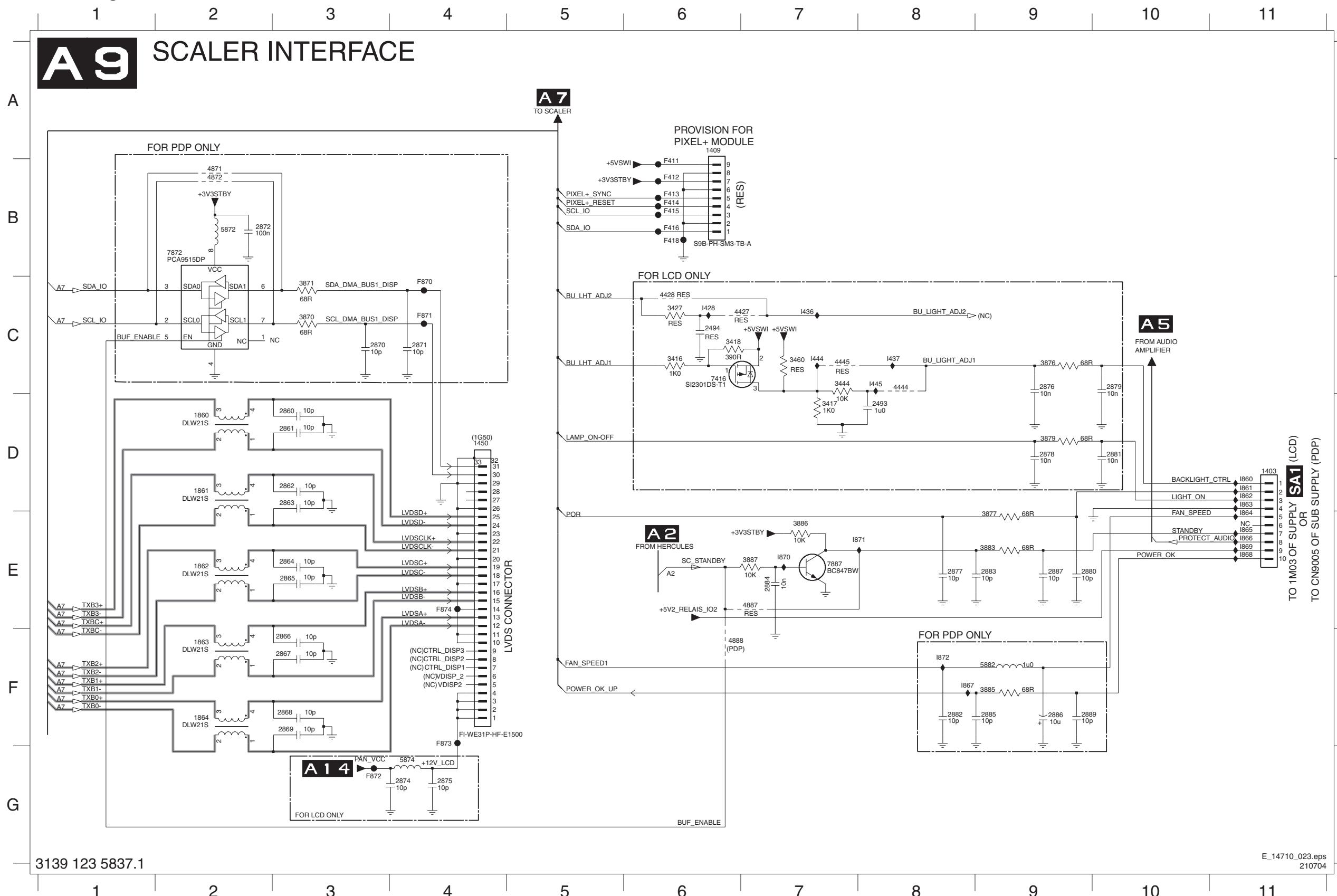


Small Signal Board: Scaler Supply

2401 C1	2405 C2	2409 C3	2413 C4	2417 B1	2421 B2	2425 B3	2429 B4	2433 B5	2437 B4	2441 B5	2445 B6	2449 C6	2453 B3	2461 C6	2465 B1	2469 B2	2473 B6	2477 B7	2481 B8	2485 A9	F401 C1	F451 A2	F466 B1	F486 A7
2402 C1	2406 C2	2410 C3	2414 C4	2418 B1	2422 B2	2426 B3	2430 B4	2434 B4	2438 B5	2442 B6	2446 A6	2450 C6	2454 B3	2462 C7	2466 B1	2470 B5	2474 B6	2478 A7	2482 B8	2486 A7	F419 B1	F461 C6	F470 B5	
2403 C1	2407 C2	2411 C3	2415 C4	2419 B2	2423 B3	2427 B3	2431 B4	2435 B4	2439 B5	2443 B6	2447 C5	2451 B2	2455 B3	2463 C5	2467 B1	2471 B6	2475 B6	2479 B8	2483 B9	2495 B7	F434 A4	F463 C5	F478 A7	
2404 C2	2408 C3	2412 C3	2416 C4	2420 B2	2424 B3	2428 B4	2432 B4	2436 B4	2440 B5	2444 B6	2448 C5	2452 B3	2456 A3	2464 C5	2468 B2	2472 B6	2476 B7	2480 B8	2484 B9	2496 B8	F447 C5	F465 A1	F482 A9	

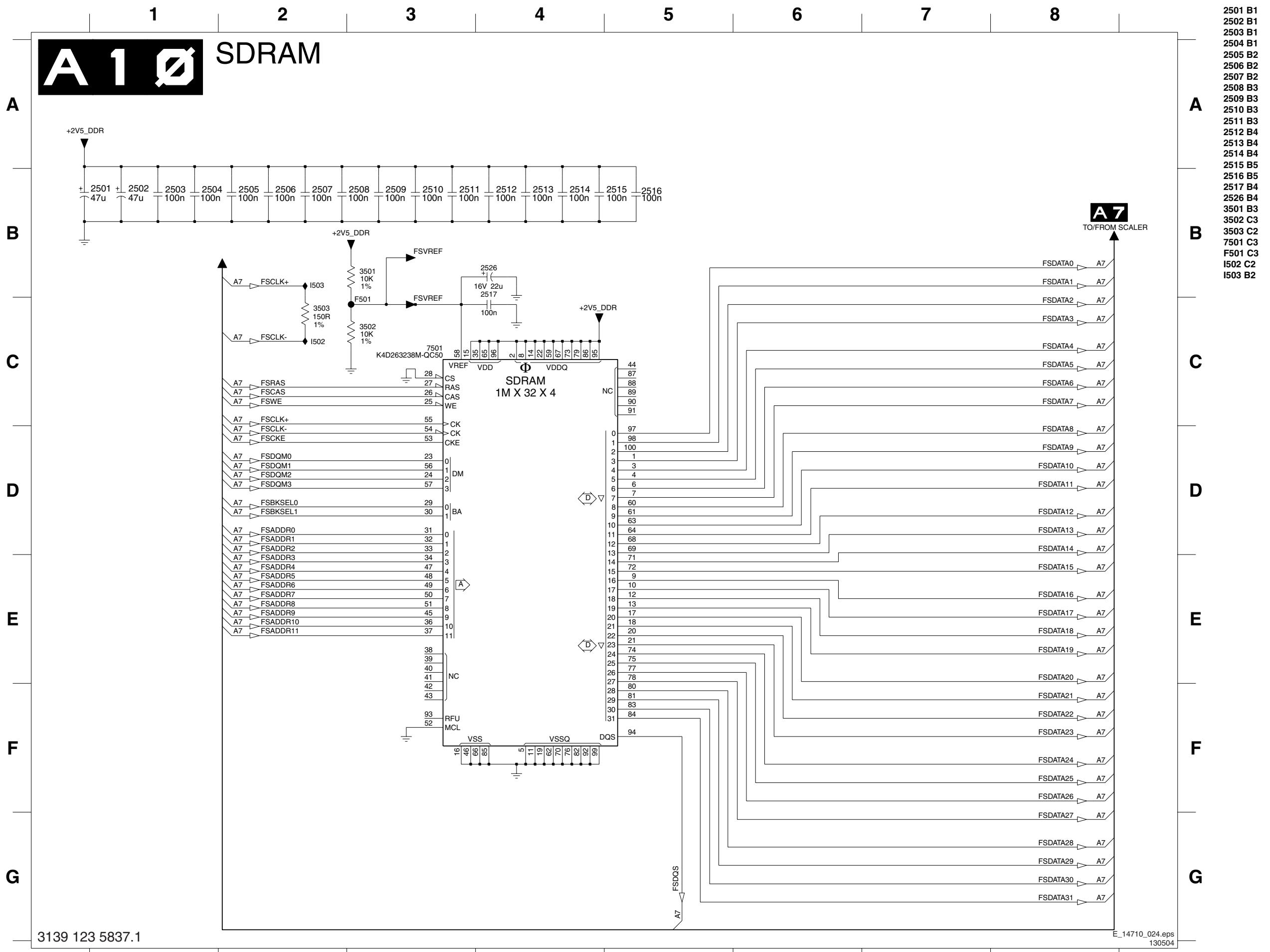


Small Signal Board: Scaler Interface

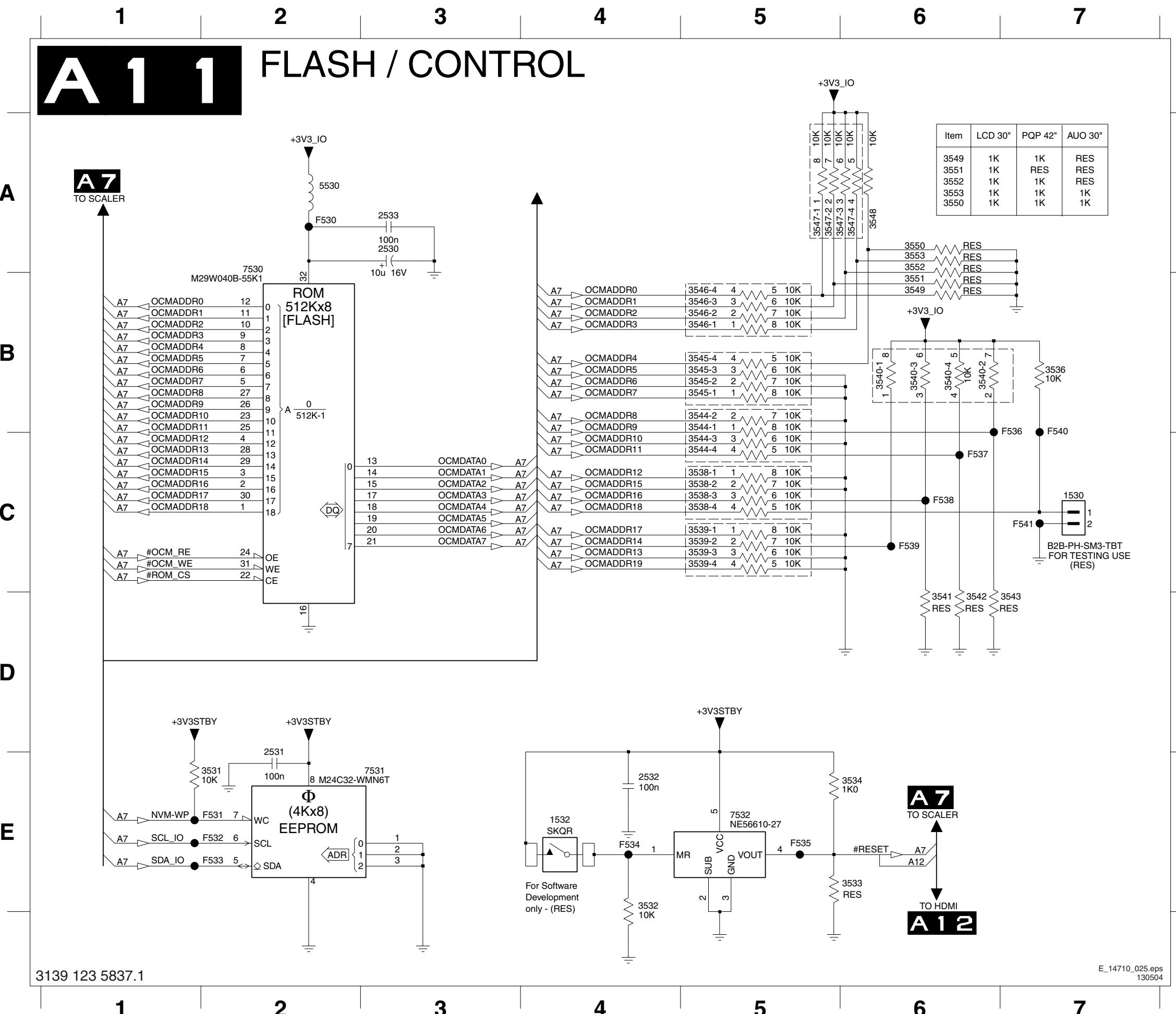


1403 D11 I862 D11
1409 A6 I863 D11
1450 D4 I864 E11
1860 D2 I865 E11
1861 D2 I866 E11
1862 E2 I867 F8
1863 F2 I868 E11
1864 F2 I869 E11
2493 D8 I870 E7
2494 C6 I871 E8
2860 D3 I872 F8
2861 D3
2862 D3
2863 D3
2864 E3
2865 E3
2866 F3
2867 F3
2868 F3
2869 F3
2870 C3
2871 C4
2872 B2
2874 G4
2875 G4
2876 C9
2877 E8
2878 D9
2879 C10
2880 E9
2881 D10
2882 F8
2883 E9
2884 E7
2885 F9
2886 F9
2887 E9
2889 F9
3416 C6
3417 D7
3418 C6
3427 C6
3444 C7
3460 C7
3870 C3
3871 C3
3876 C9
3877 E9
3879 D9
3883 E9
3885 F9
3886 E7
3887 E7
4427 C7
4428 C6
4444 C8
4445 C7
4871 B2
4872 B2
4887 E7
4888 F6
5872 B2
5874 G4
5882 F9
7416 C6
7872 B2
7887 E7
F411 B6
F412 B6
F413 B6
F414 B6
F415 B6
F416 B6
F418 B6
F870 C4
F871 C4
F872 G3
F873 F4
F874 E4
I428 C6
I436 C7
I437 C8
I444 C7
I445 C8
I860 D11
I861 D11

Small Signal Board: SDRAM



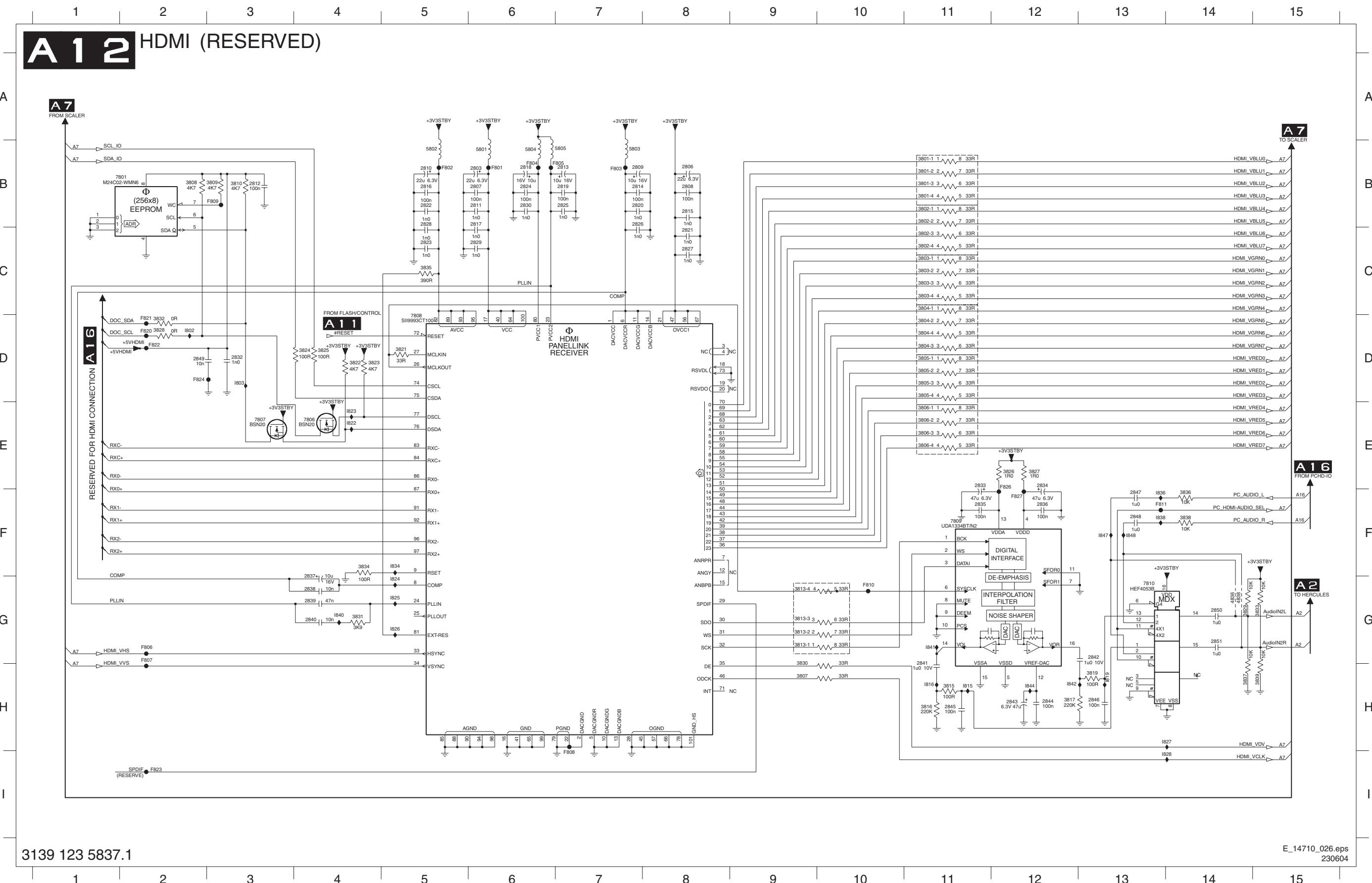
Small Signal Board: Flash / Control



1530 C7
1532 E4
2530 A3
2531 E2
2532 E4
2533 A3
3531 E2
3532 E4
3533 E6
3534 E6
3536 B7
3538-1 C5
3538-2 C5
3538-3 C5
3538-4 C5
3539-1 C5
3539-2 C5
3539-3 C5
3539-4 C5
3540-1 B6
3540-2 B6
3540-3 B6
3540-4 B6
3541 D6
3542 D6
3543 D7
3544-1 B5
3544-2 B5
3544-3 C5
3544-4 C5
3545-1 B5
3545-2 B5
3545-3 B5
3545-4 B5
3546-1 B5
3546-2 B5
3546-3 B5
3546-4 B5
3547-1 A5
3547-2 A5
3547-3 A6
3547-4 A6
3548 A6
3549 B6
3550 A6
3551 B6
3552 A6
3553 A6
5530 A2
7530 A2
7531 E3
7532 E5
F530 A2
F531 E2
F532 E2
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F535 E5
F536 C7
F537 C6
F538 C6
F539 C6
F540 C7
F541 C7

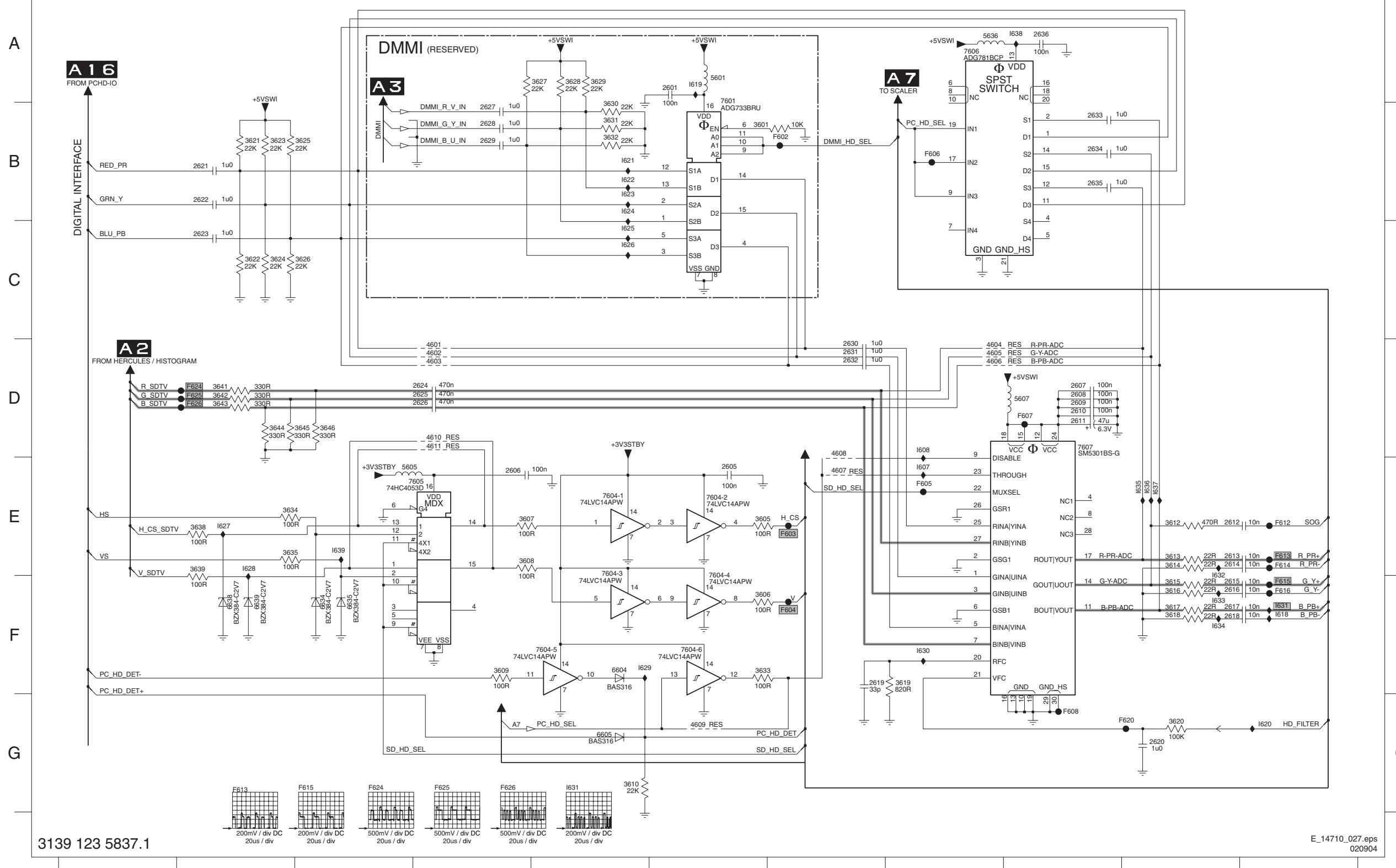
Small Signal Board: HDMI

2803 B6	2810 B5	2815 B8	2820 B7	2825 B7	2830 B6	2836 F12	2841 G11	2846 H13	2851 G14	3802-1 B11	3803-2 C11	3804-3 D11	3805-4 D11	3807 H9	3813-2 G9	3817 H12	3824 D4	3829 G14	3834 F4	3839 H15	5803 B7	7807 E3	F802 B5	F807 G2	F820 D2	F826 E12	I816 H11	I825 G5	I836 F13	I844 H12
2806 B8	2811 B6	2816 B5	2821 C8	2826 B7	2832 D3	2837 G4	2842 G13	2847 F13	3801-1 B11	3802-2 B11	3803-3 C11	3804-4 D11	3806-1 E11	3808 B2	3813-3 G9	3819 H13	3825 D2	3830 H9	3835 C5	4836 G14	5804 B6	7808 D5	F803 B7	F808 I7	F821 D2	F827 F12	I819 H13	I826 G5	I838 F13	I847 T13
2807 B6	2812 B3	2817 B6	2822 B5	2827 C8	2833 E11	2838 G4	2843 H12	2848 F13	3801-2 B11	3802-3 C11	3803-4 C11	3805-1 D11	3806-2 E11	3809 B3	3813-4 G9	3821 D5	3826 E12	3831 G4	3836 F14	4838 G14	5805 B7	7809 F11	F804 B6	F809 B3	F822 D2	I820 D2	I822 E4	I827 H14	I840 G4	I848 C13
2808 B8	2813 B7	2818 B6	2823 C5	2828 B5	2834 E12	2839 G4	2844 H12	2849 D2	3801-3 B11	3802-4 C11	3804-5 C11	3805-2 D11	3806-3 E11	3815 H11	3822 D4	3827 E12	3832 D2	3837 H14	5801 B6	7801 B2	7810 G13	F805 B7	F810 G10	F823 I2	I803 D3	I823 E4	I828 H4	I841 G11	I845 F13	
2809 B7	2814 B7	2819 B7	2824 B6	2829 C6	2835 F11	2840 G4	2850 G14	2855 H11	3801-4 B11	3803-5 C11	3804-2 D11	3805-3 D11	3806-4 E11	3813-1 G9	3816 H11	3823 D4	3828 D2	3833 G15	3838 F14	5802 B5	7806 E4	F801 B6	F806 G2	F811 F13	F824 D2	I815 H11	I824 G5	I834 F5	I842 H12	



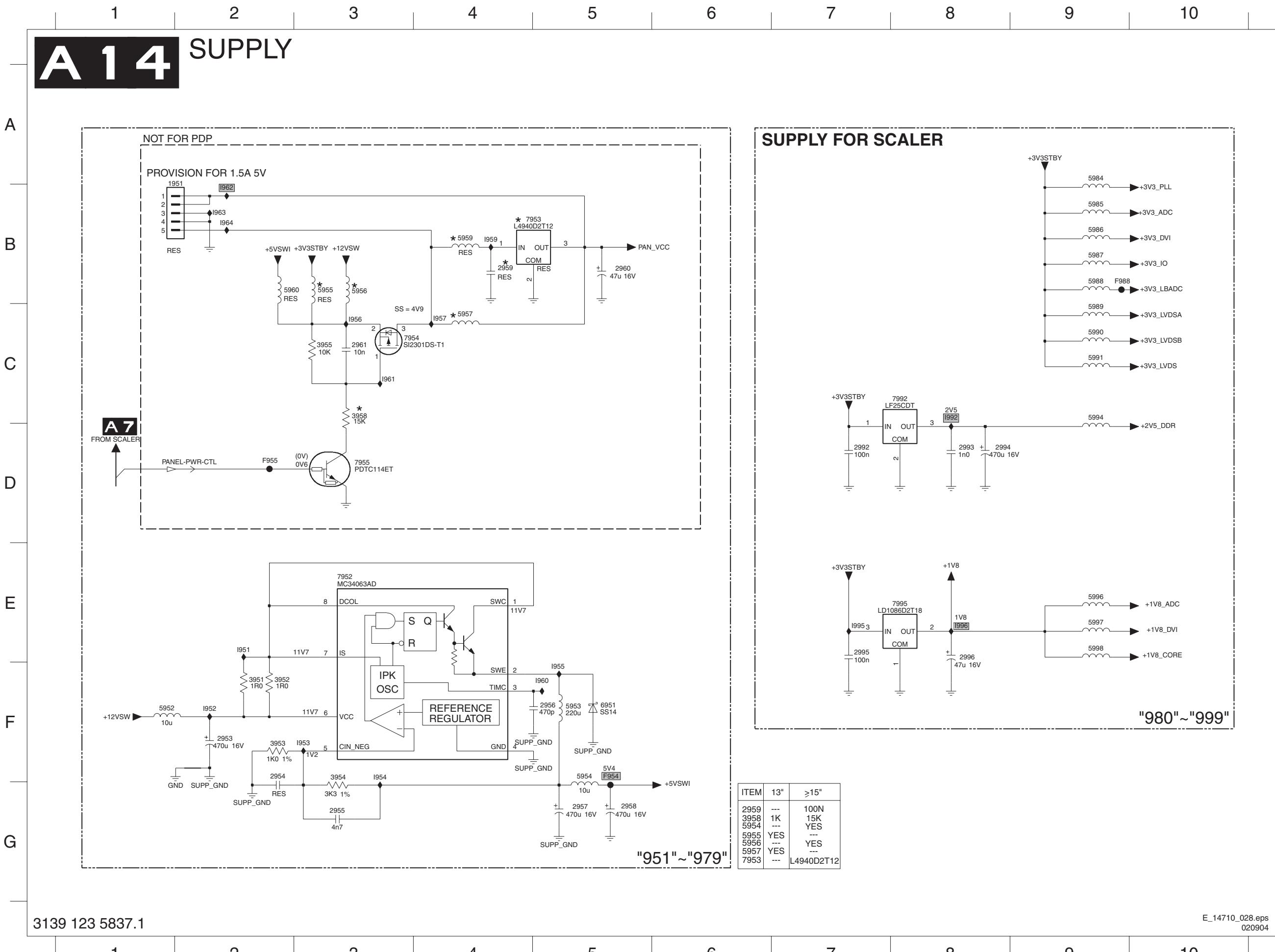
Small Signal Board: PCHD MUX

A 1 3 PCHD-MUX

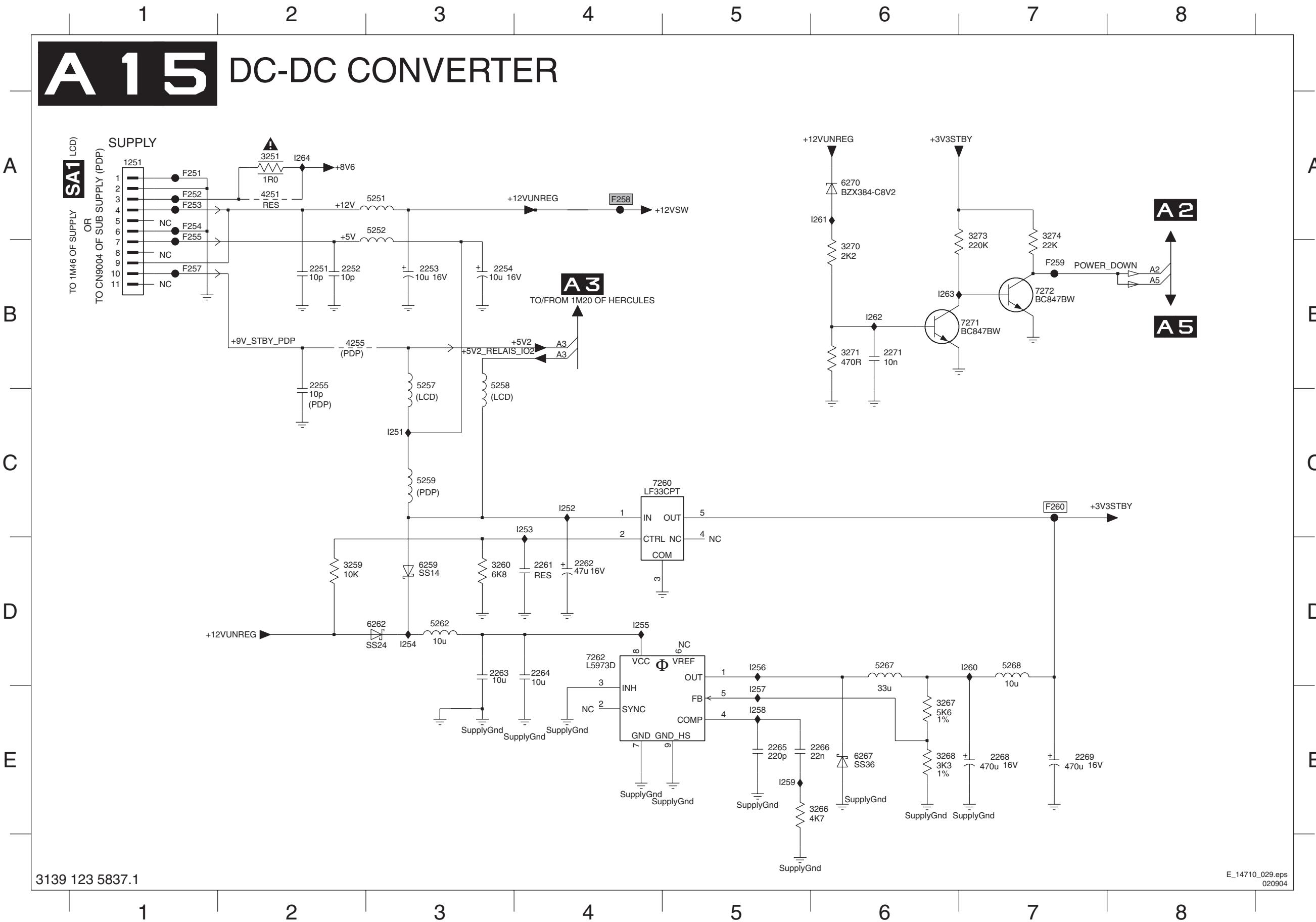


2601 A6	7601 B6
2605 E6	7604-1 E5
2606 E4	7604-2 E6
2607 D9	7604-3 F5
2608 D9	7604-4 F6
2609 D9	7604-5 F5
2610 D9	7604-6 F6
2611 D9	7605 E4
2612 E10	7606 A8
2613 E10	7607 D9
2614 E10	F602 B7
2615 F10	F603 E7
2616 F10	F604 F7
2617 F10	F605 E8
2618 F10	F606 B8
2619 F7	F607 D9
2620 G10	F608 G9
2621 B2	F612 E11
2622 B2	F613 E11
2623 C2	F614 E11
2624 D4	F615 F11
2625 D4	F616 F11
2626 D4	F620 G10
2627 B4	F624 D2
2628 B4	F625 D2
2629 B4	F626 D2
2630 D7	I607 E8
2631 D7	I608 D8
2632 D7	I618 F11
2633 B9	I619 A6
2634 B9	I620 G11
2635 B9	I621 B5
2636 A9	I622 B5
2601 B6	I623 B5
2605 E6	I624 B5
2606 F6	I625 C5
2607 E4	I626 C5
2608 E4	I627 E2
2609 F4	I628 E2
2610 G5	I629 F5
2612 E10	I630 F8
2613 E10	I631 F11
2614 E10	I632 E10
2615 F10	I633 F10
2616 F10	I634 F10
2617 F10	I635 E10
2618 F10	I636 E10
2619 F8	I637 E10
2620 G10	I638 A9
2621 B2	I639 E3
2622 C2	
2623 B2	
2624 C2	
2625 B3	
2626 C3	
2627 A5	
2628 A5	
2629 A5	
2630 A5	
2631 B5	
2632 B5	
2633 F6	
2634 E2	
2635 E2	
2638 E2	
2639 E2	
2641 D2	
2642 D2	
2643 D2	
2644 D2	
2645 D3	
2646 D3	
2601 D4	
2602 D4	
2603 D4	
2604 D8	
2605 D8	
2606 D8	
2607 E7	
2608 D7	
2609 G6	
2610 D4	
2611 D4	
2601 A6	
2605 E3	
2607 D9	
2636 A8	
2604 F5	
2605 G5	
2634 F3	
2635 F3	
2638 F2	
2620 F2	

Small Signal Board: Supply

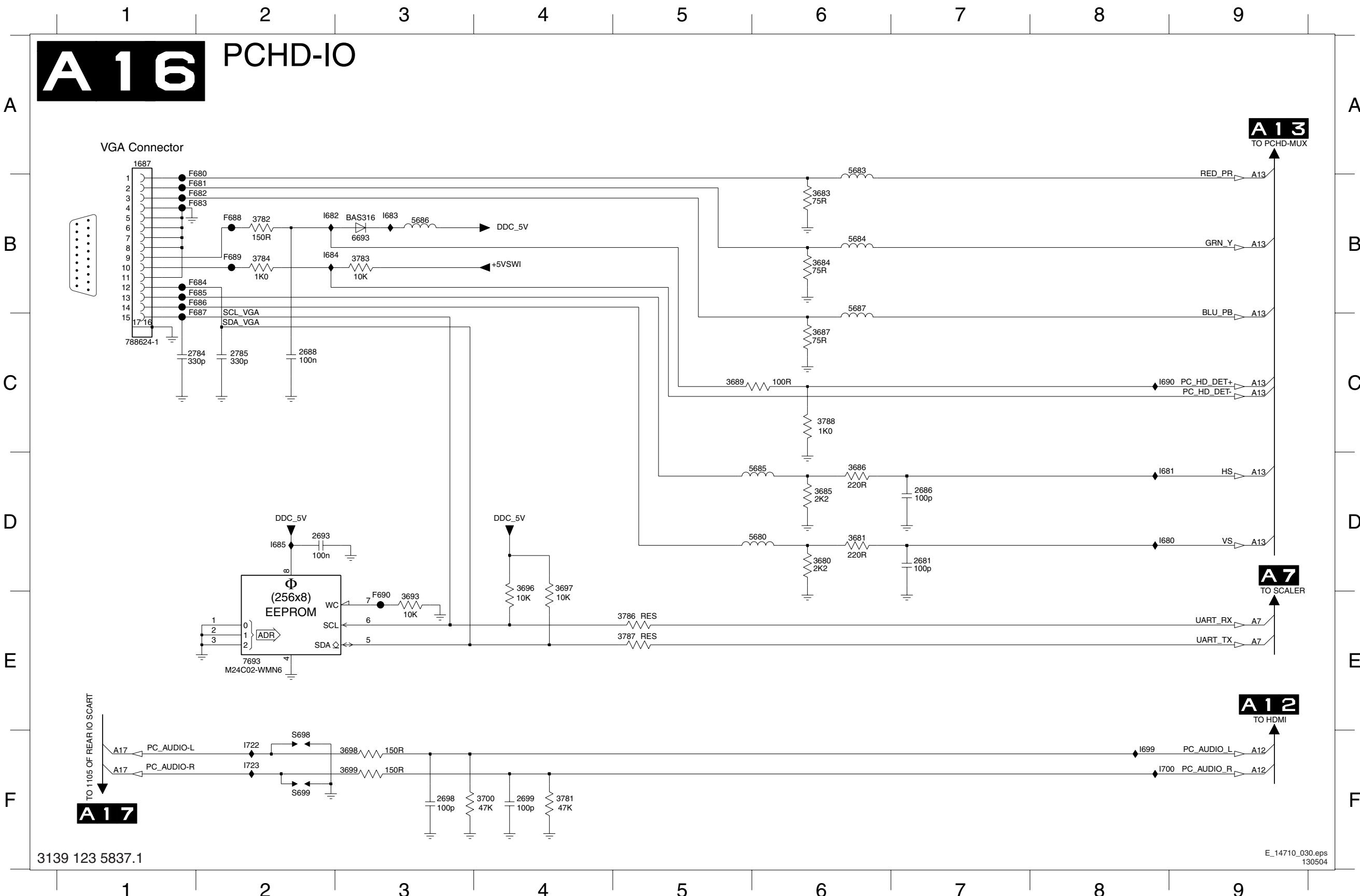


Small Signal Board: DC-DC Converter



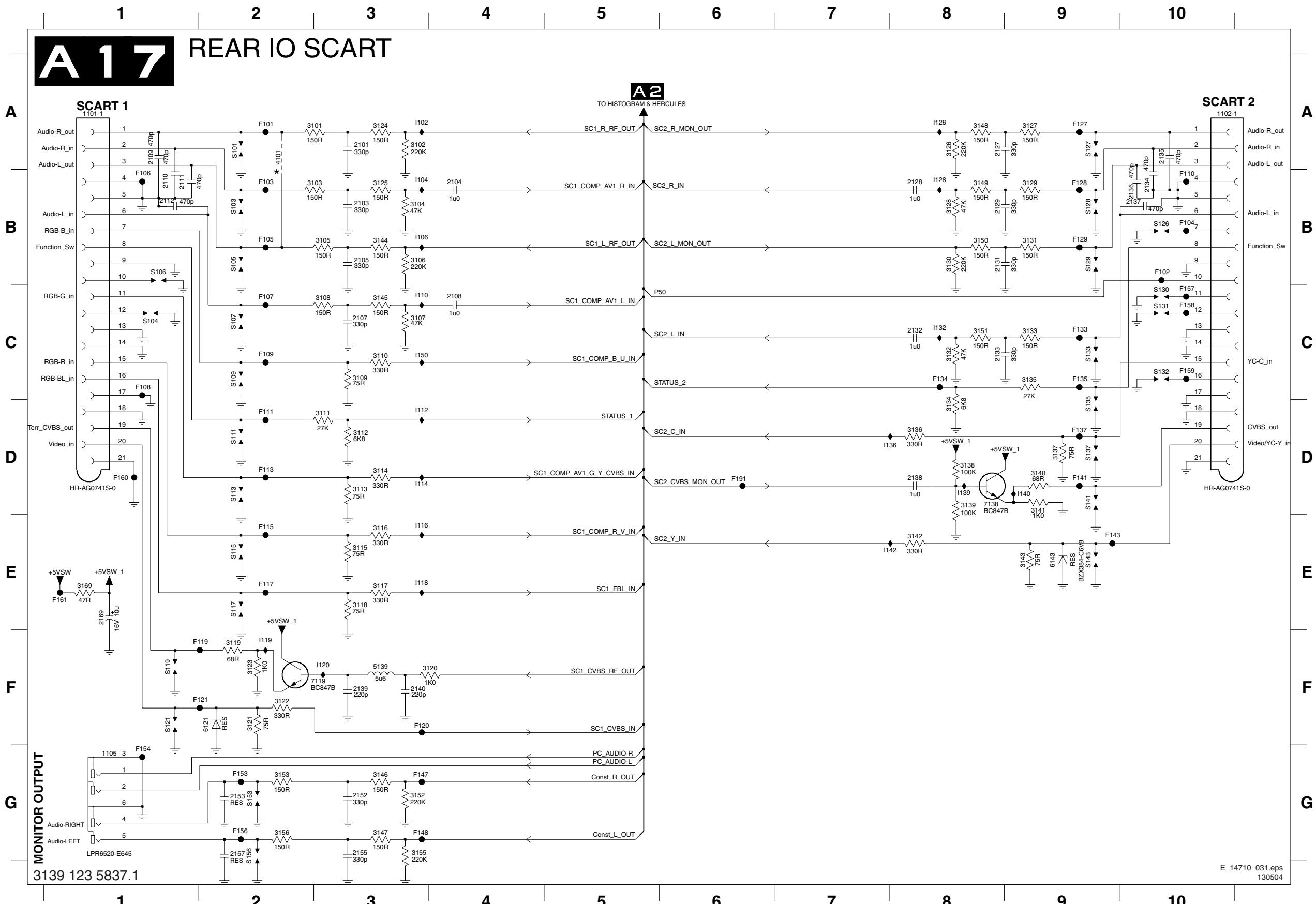
1251 A1
2251 B2
2252 B2
2253 B3
2254 B3
2255 B2
2261 D4
2262 D4
2263 D3
2264 D4
2265 E5
2266 E5
2268 E7
2269 E7
2271 B6
3251 A2
3259 D2
3260 D3
3266 E5
3267 E6
3268 E6
3270 B6
3271 B6
3273 A7
3274 A7
4251 A2
4255 B2
5251 A3
5252 A3
5257 B3
5258 B3
5259 C3
5262 D3
5267 D6
5268 D7
6259 D3
6262 D3
6267 E6
6270 A6
7260 C4
7262 D4
7271 B7
7272 B7
F251 A1
F252 A1
F253 A1
F254 A1
F255 A1
F257 B1
F258 A4
F259 B7
F260 C7
I251 C3
I252 C4
I253 C4
I254 D3
I255 D4
I256 D5
I257 E5
I258 E5
I259 E5
I260 D7
I261 A6
I262 B6
I263 B6
I264 A2

Small Signal Board: PCHD IO



1687 A1
 2681 D7
 2686 D7
 2688 C2
 2693 D2
 2698 F3
 2699 F4
 2784 C1
 2785 C2
 3680 D6
 3681 D6
 3683 B6
 3684 B6
 3685 D6
 3686 D6
 3687 C6
 3689 C5
 3693 E3
 3696 D4
 3697 D4
 3698 F3
 3699 F3
 3700 F4
 3781 F4
 3782 B2
 3783 B3
 3784 B2
 3786 E5
 3787 E5
 3788 C6
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 5685 D6
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 5687 B6
 6693 B3
 7693 E2
 F680 B2
 F681 B2
 F682 B2
 F683 B2
 F684 B2
 F685 B2
 F686 B2
 F687 C2
 F688 B2
 F689 B2
 F690 E3
 F691 E3
 I680 D8
 I681 D8
 I682 B2
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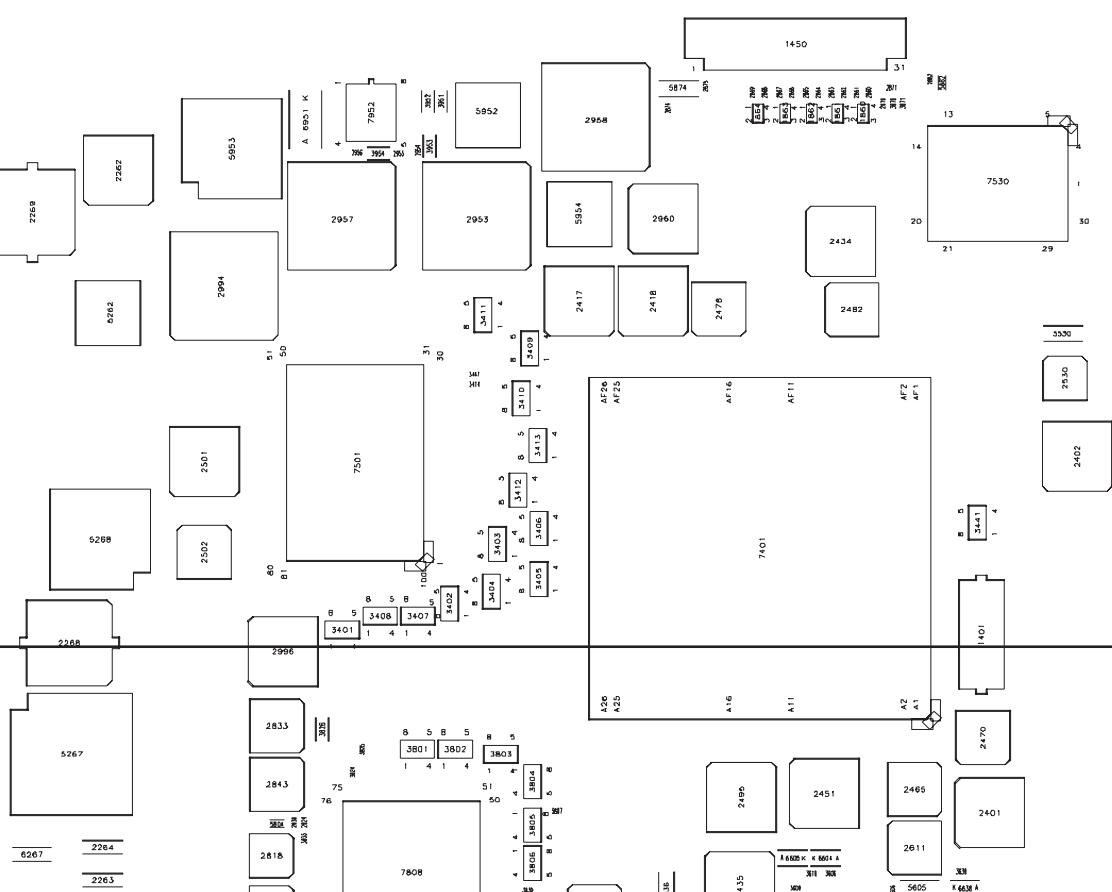
Small Signal Board: Rear IO Scart



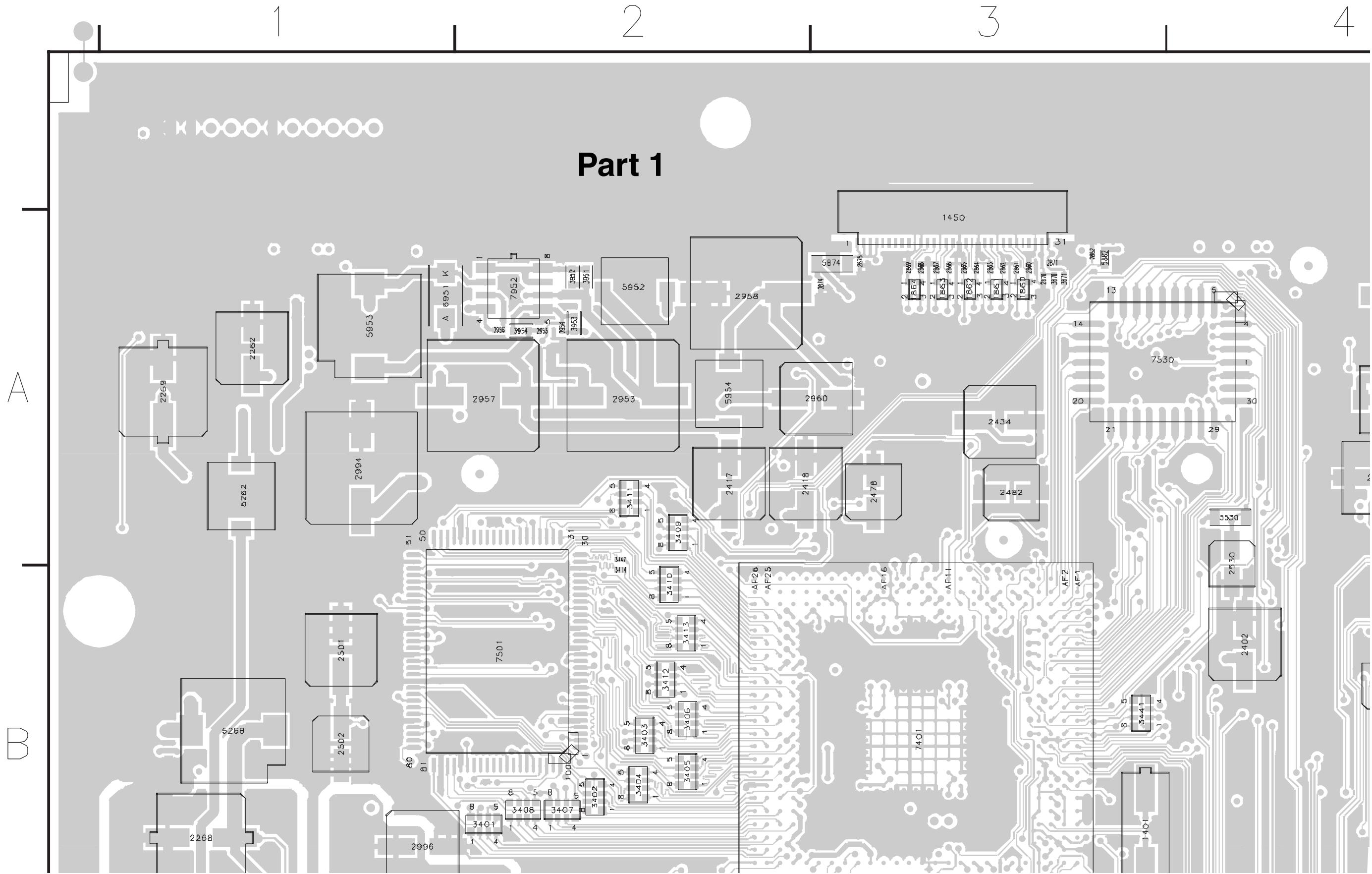
Layout Small Signal Panel (Top Side Overview)

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2024	A5	2112	D5	2157	D2	2382	B5	2502	B1	2698	D2	2824	C1	2866	A3	2935	B5	3015	B4	3104	D5	3121	D4	3138	D3	3156	D2	3402	B2	3562	B5	3634	C3	3700	D2	3802	C2	3930	A4	5003	B5	5686	D2	6563	B5	7014	B4	7605	C3		

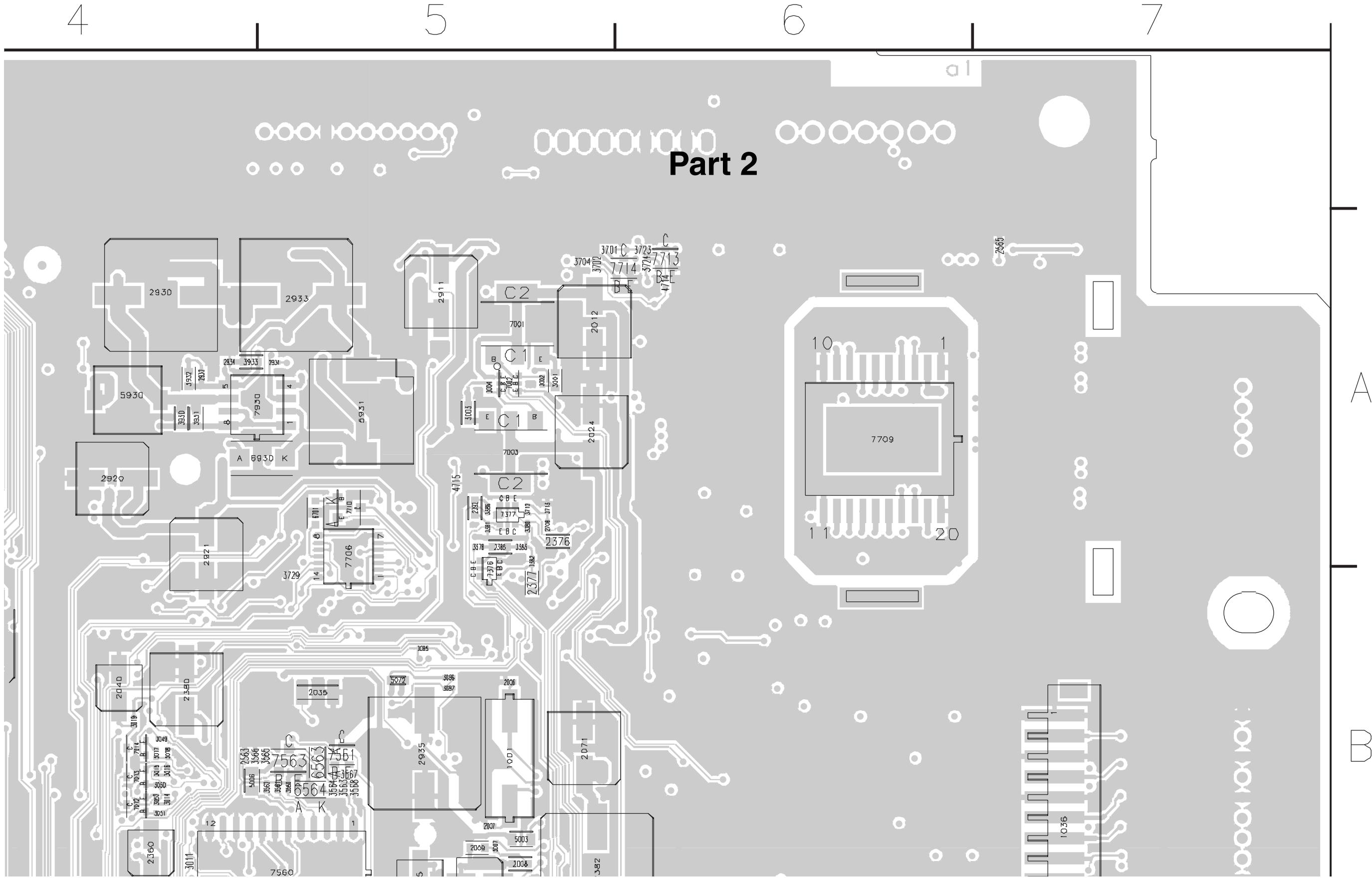
Part 1
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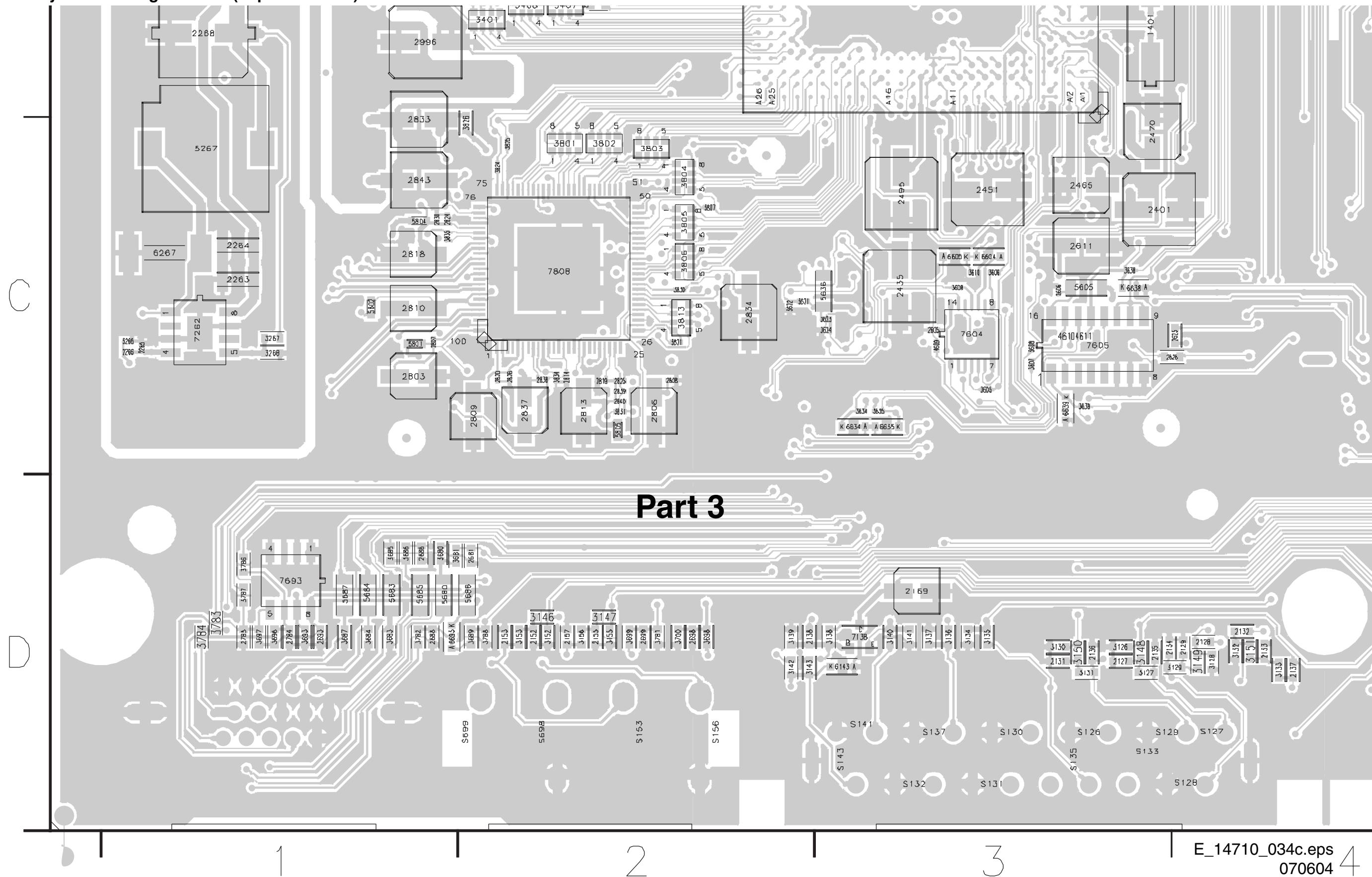
Layout Small Signal Panel (Top Side Part 1)



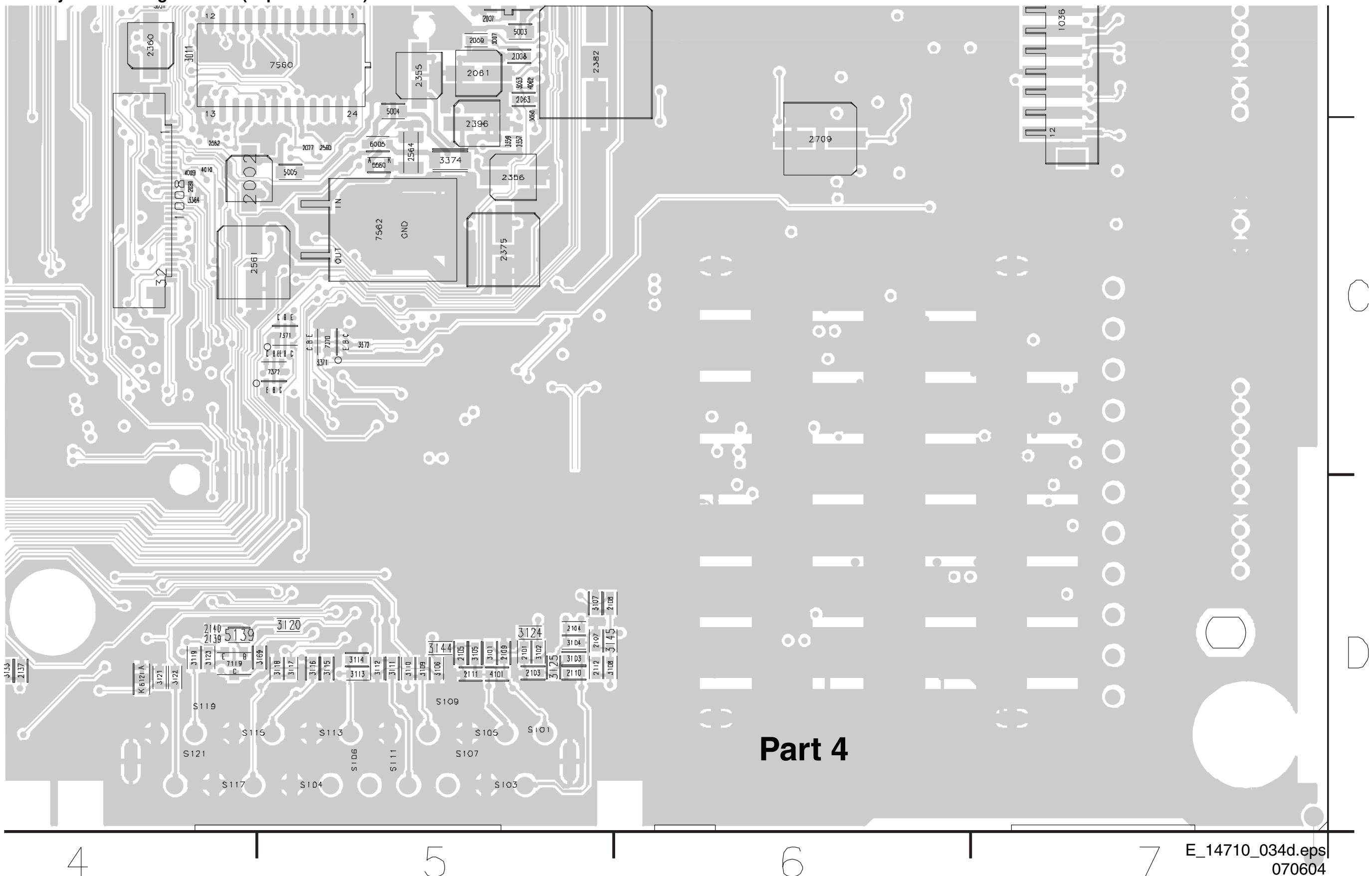
Layout Small Signal Panel (Top Side Part 2)



Layout Small Signal Panel (Top Side Part 3)



Layout Small Signal Panel (Top Side Part 4)



4

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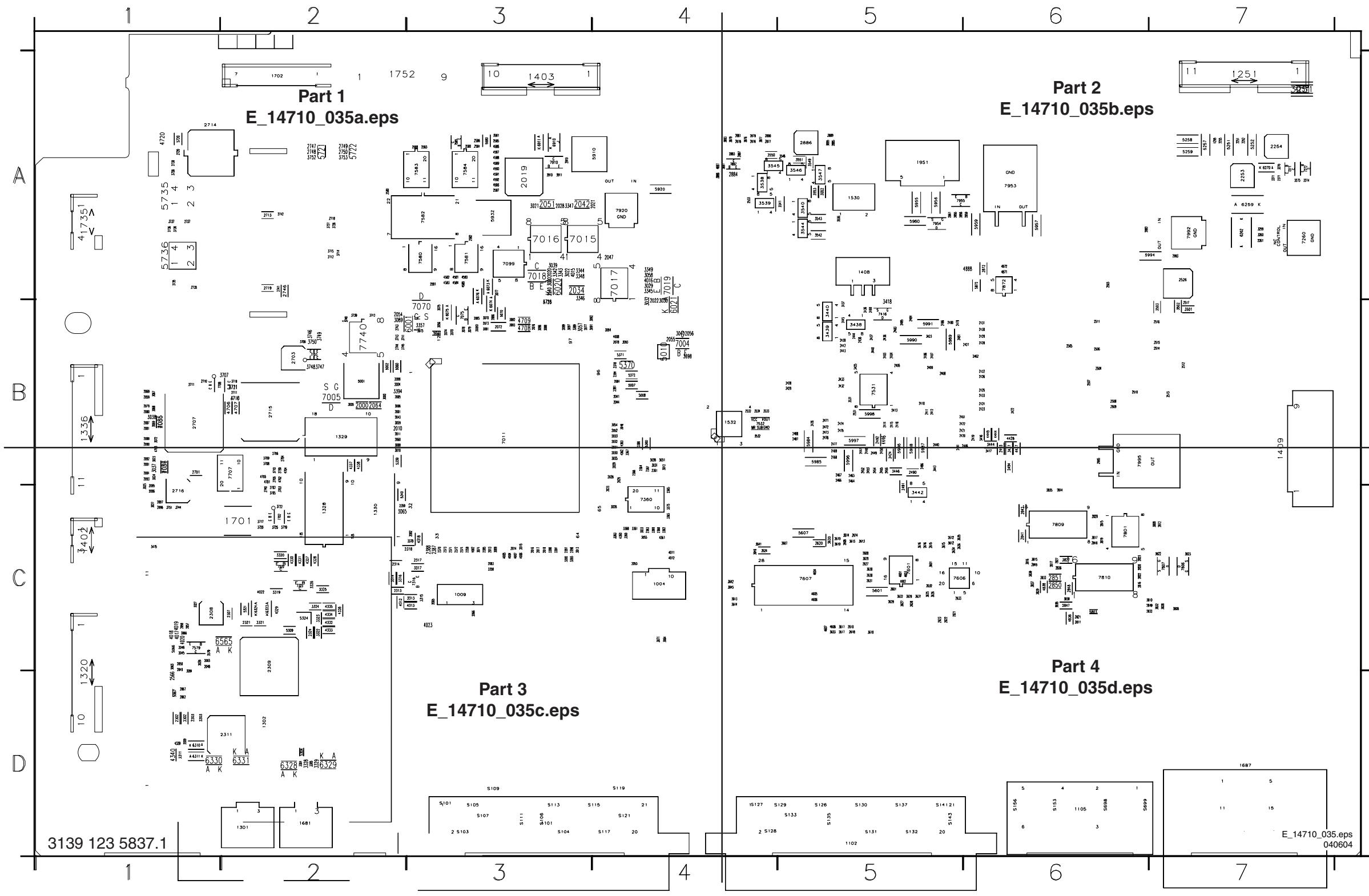
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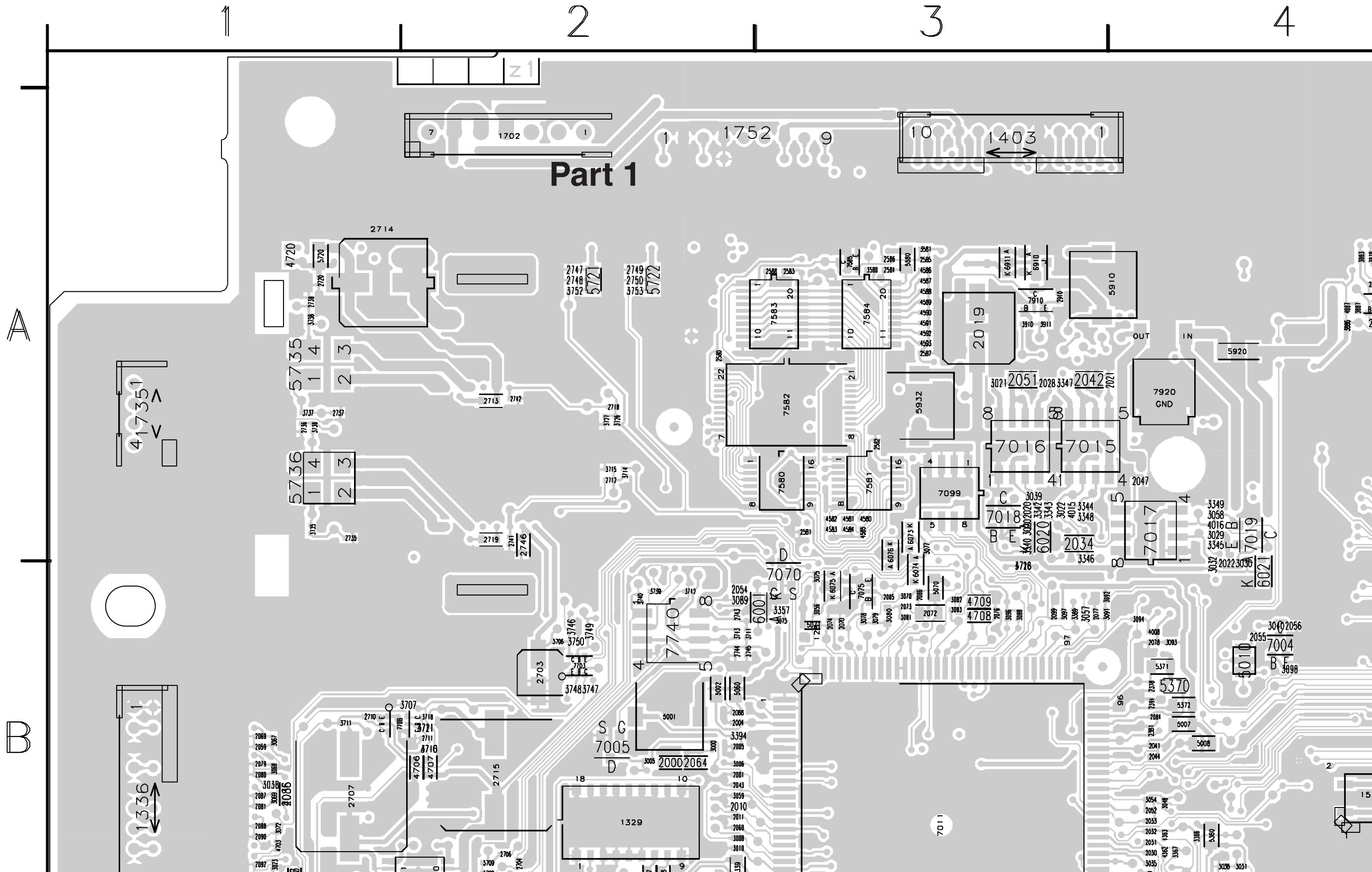
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Layout Small Signal Panel (Bottom Side Overview)

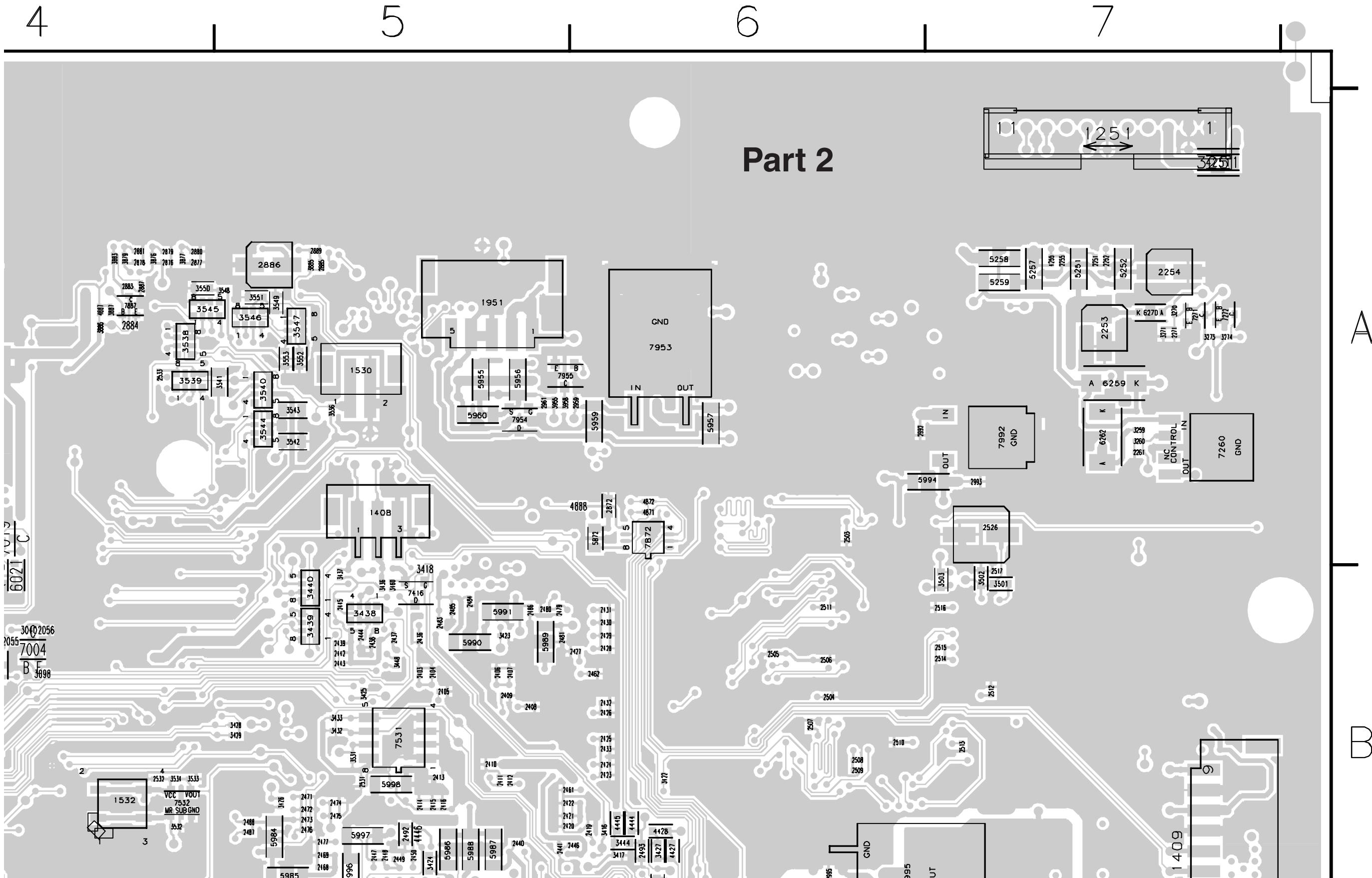
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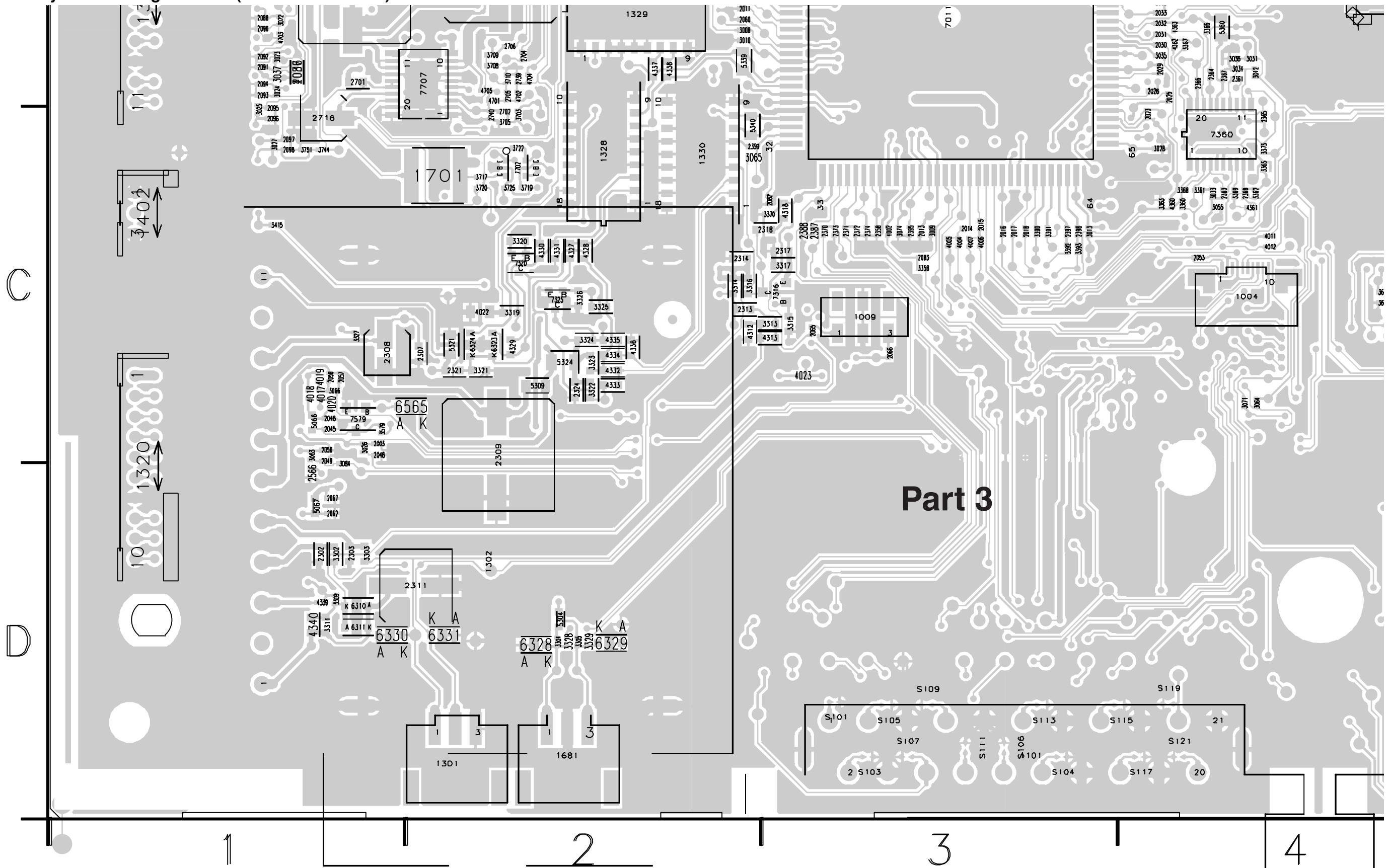
Layout Small Signal Panel (Bottom Side Part 1)



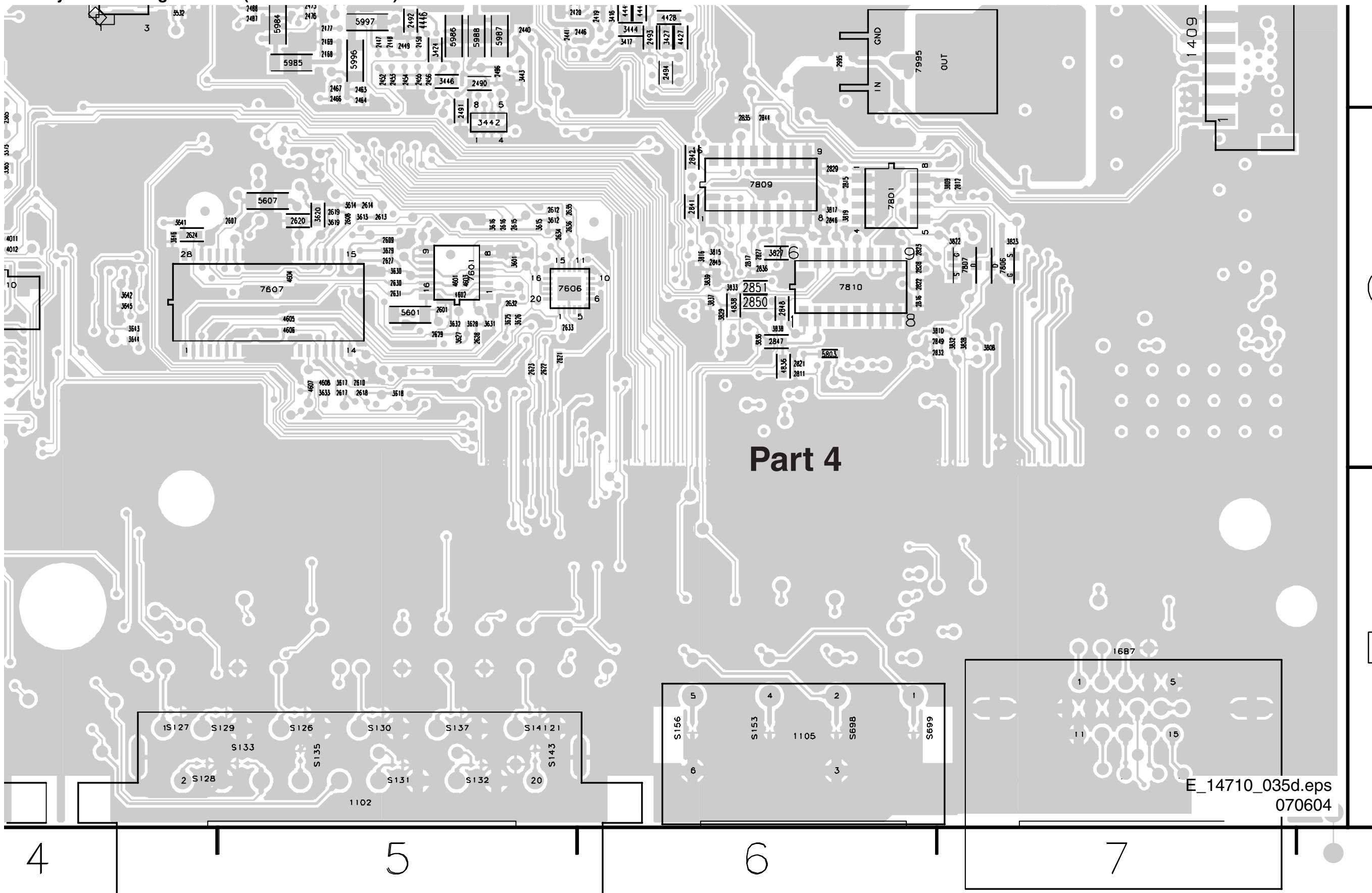
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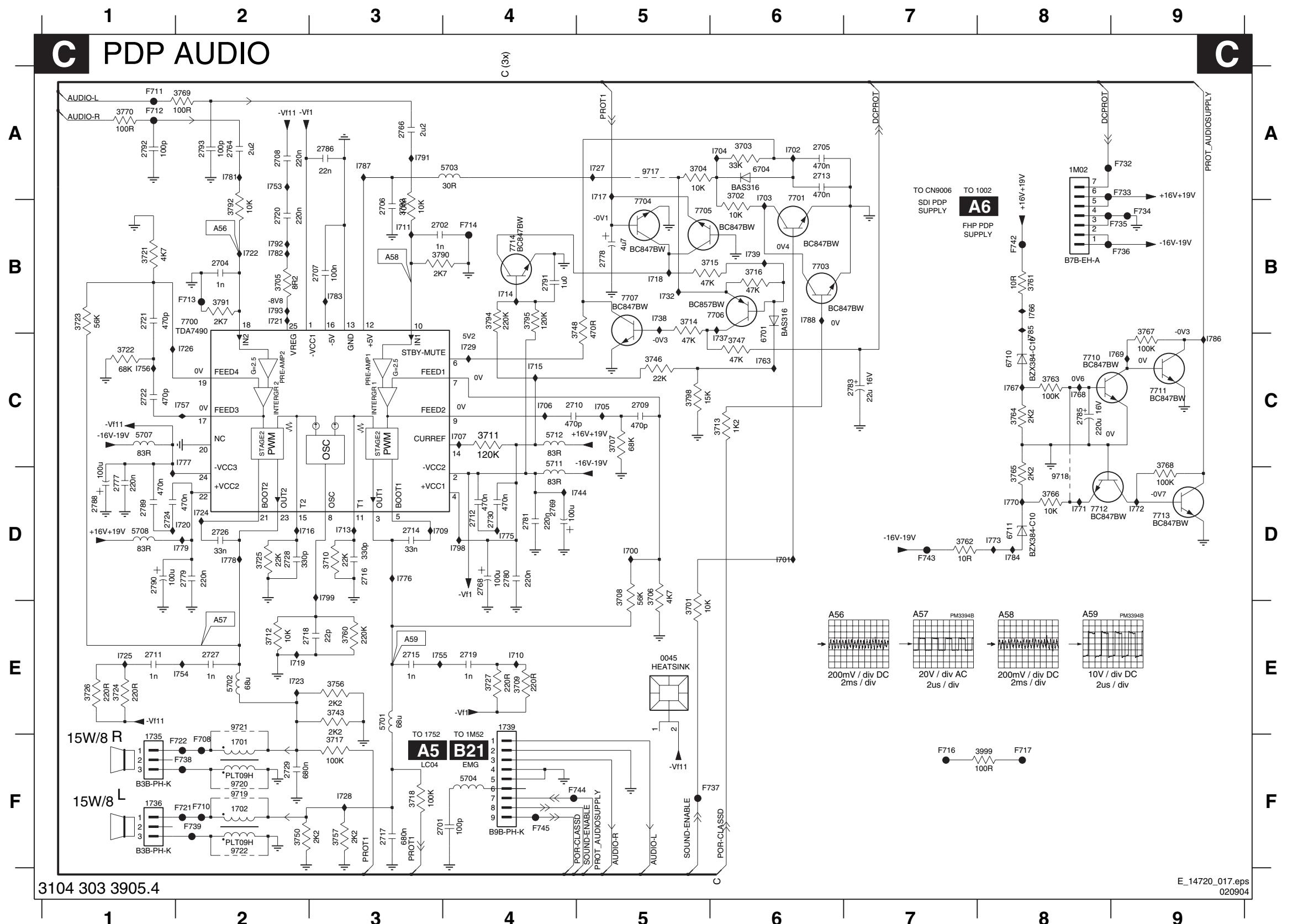
Layout Small Signal Panel (Bottom Side Part 3)



Layout Small Signal Panel (Bottom Side Part 4)



PDP Audio Panel

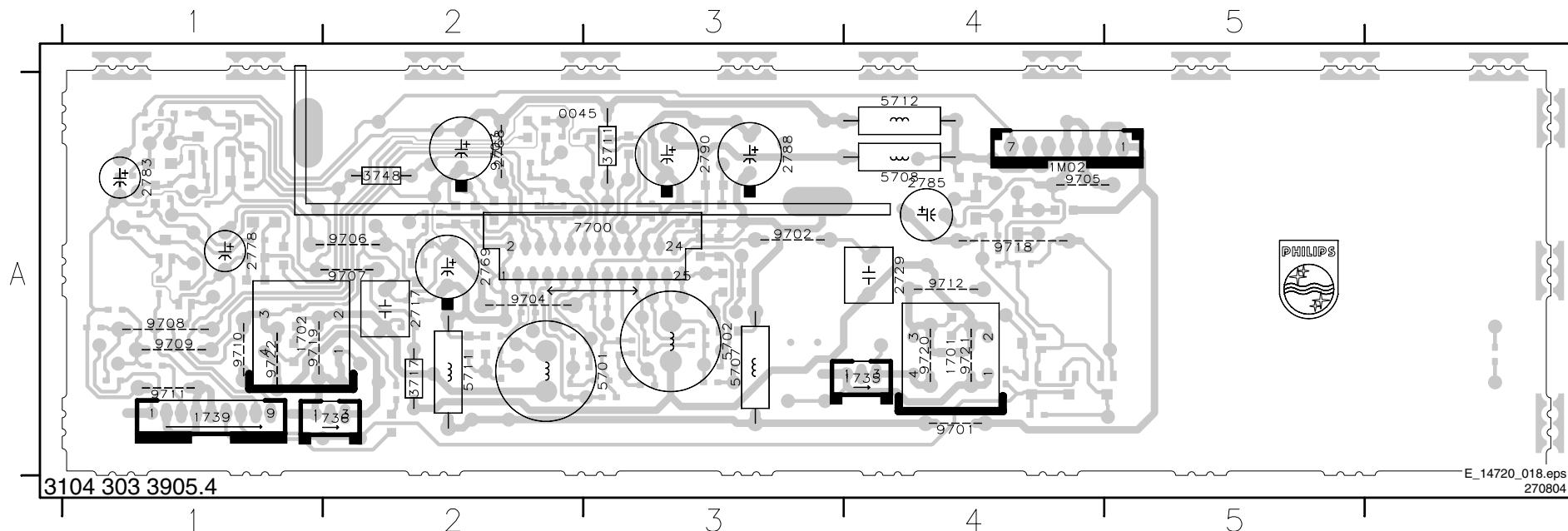


Layout PDP Audio Panel (Top Side)

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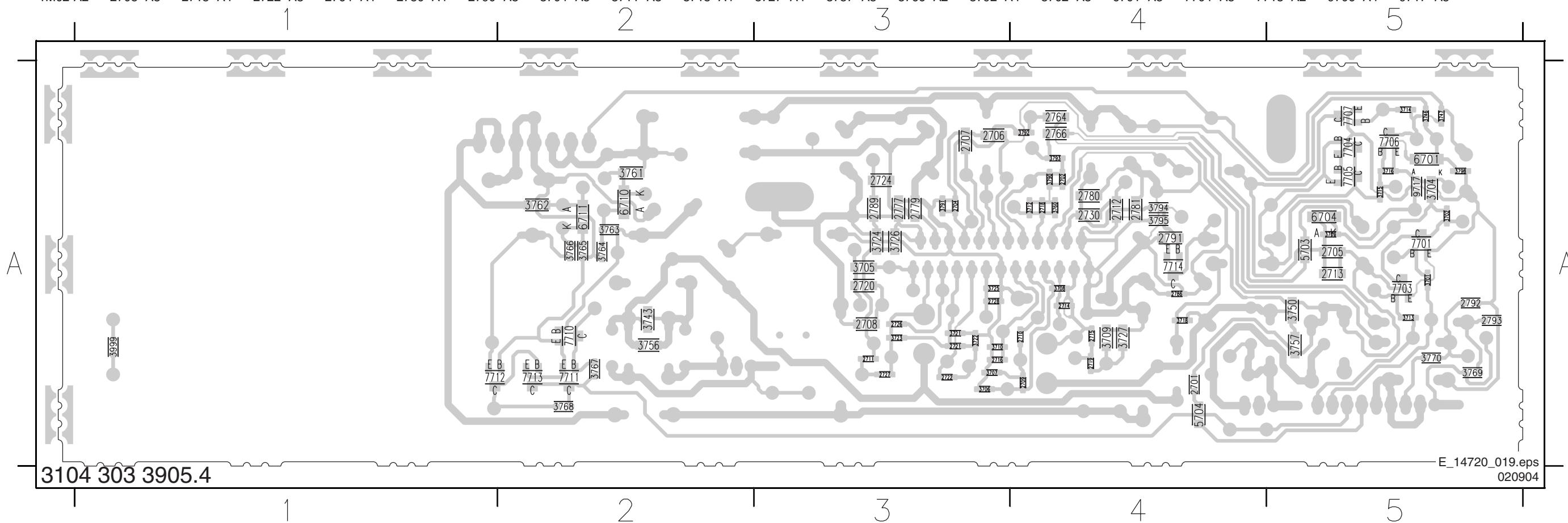
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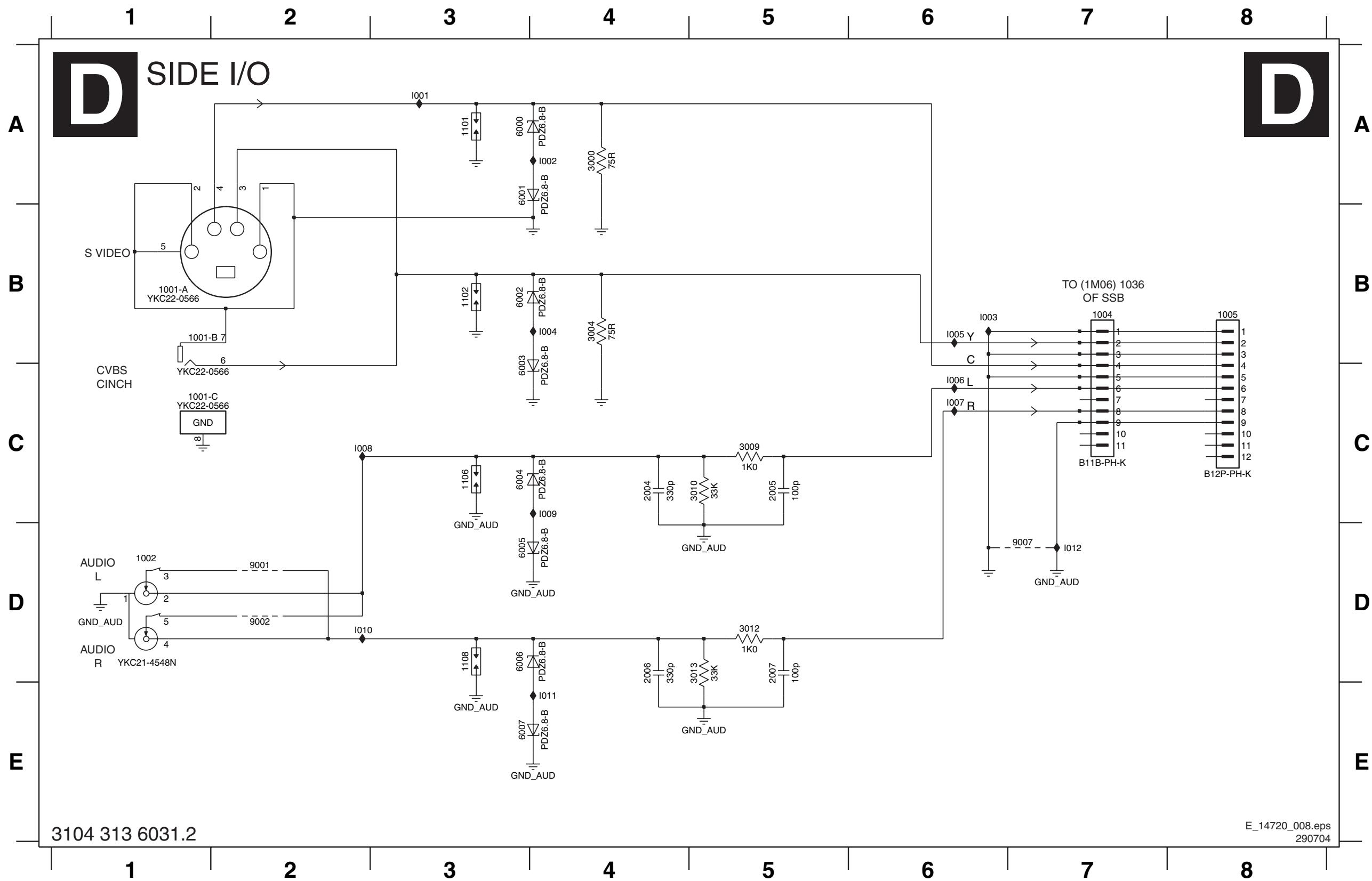


Layout PDP Audio Panel (Bottom Side)

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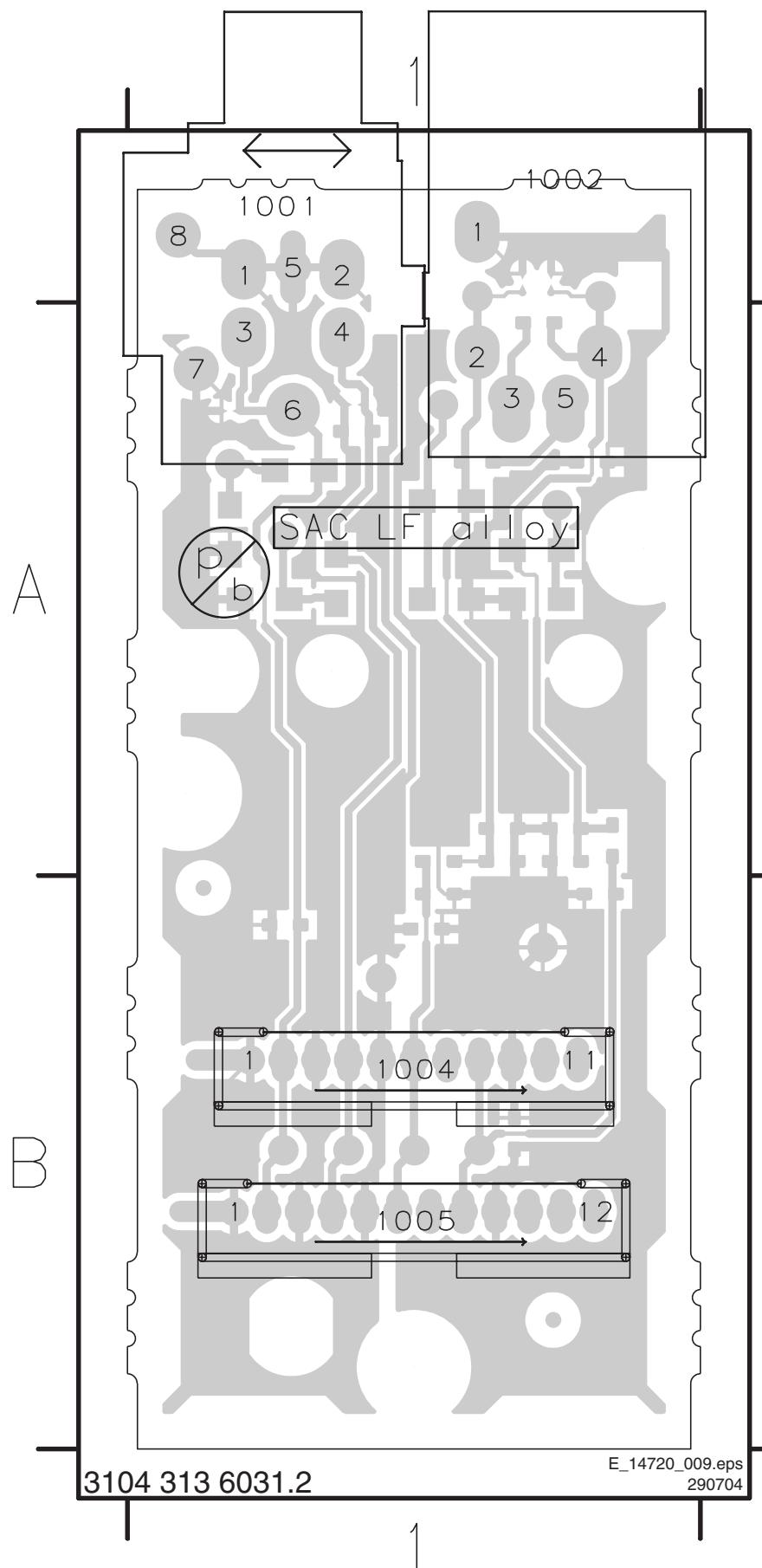


Side I/O Panel

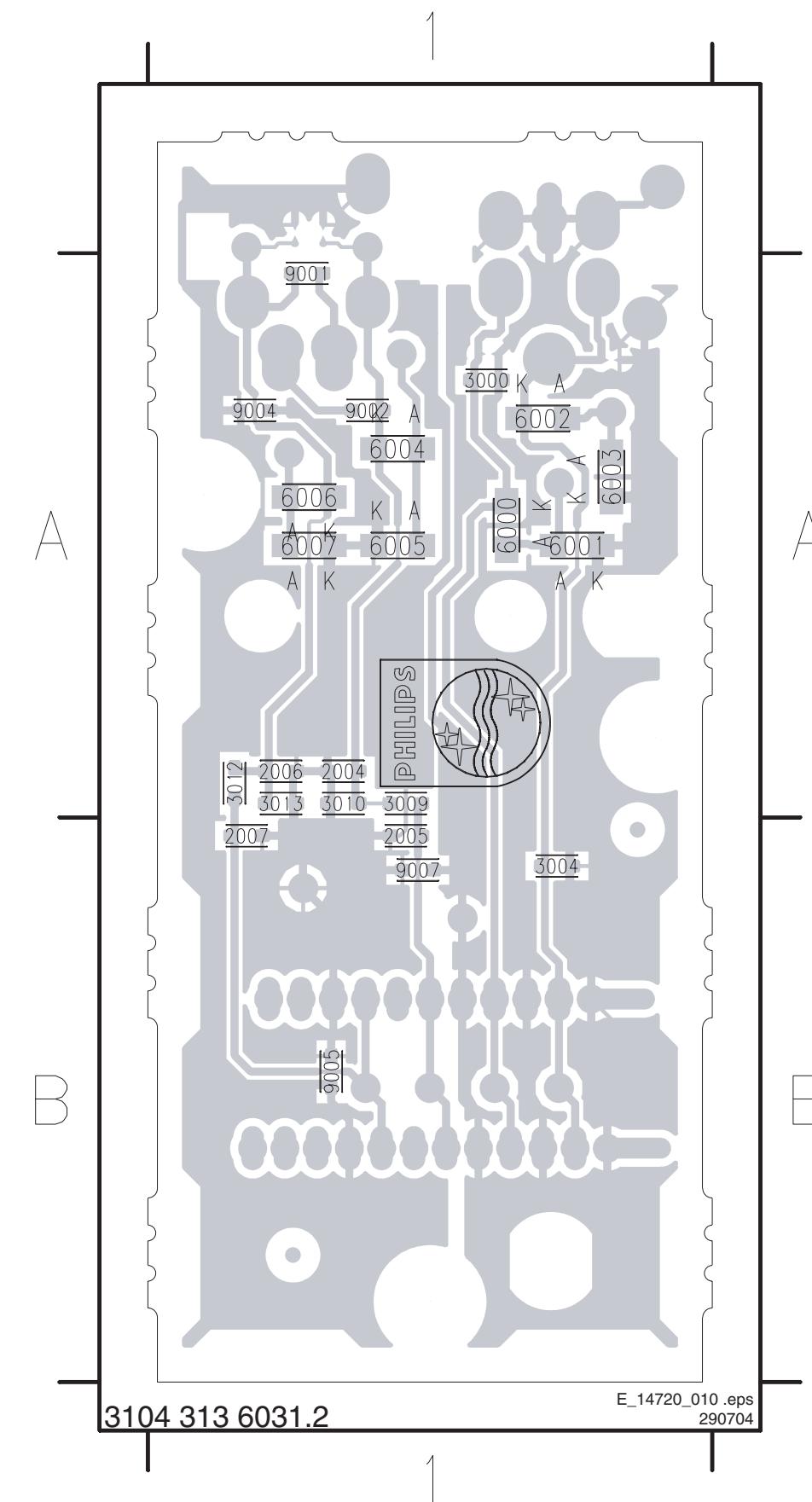


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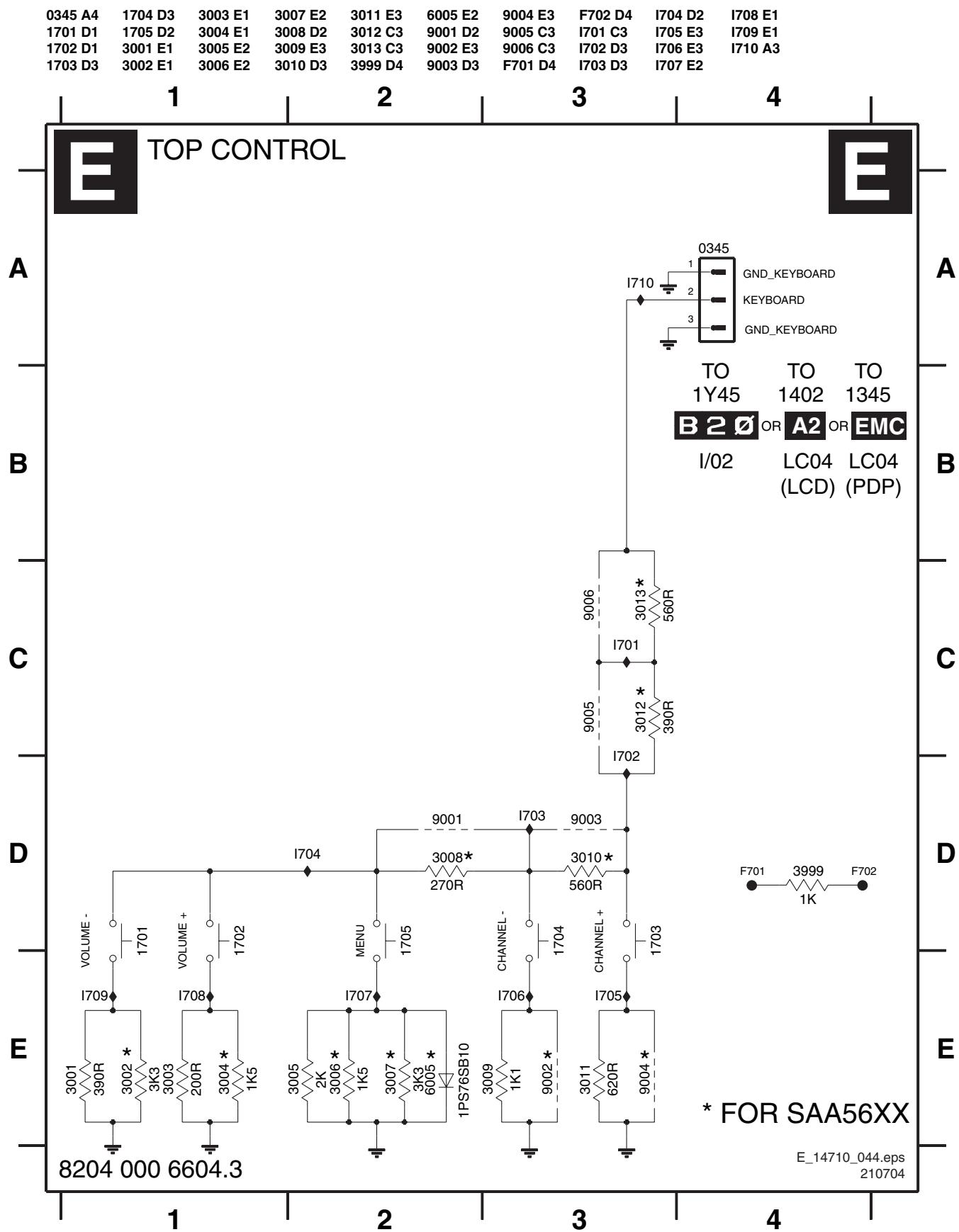
Layout Side I/O Panel (Top Side)



Layout Side I/O Panel (Bottom Side)

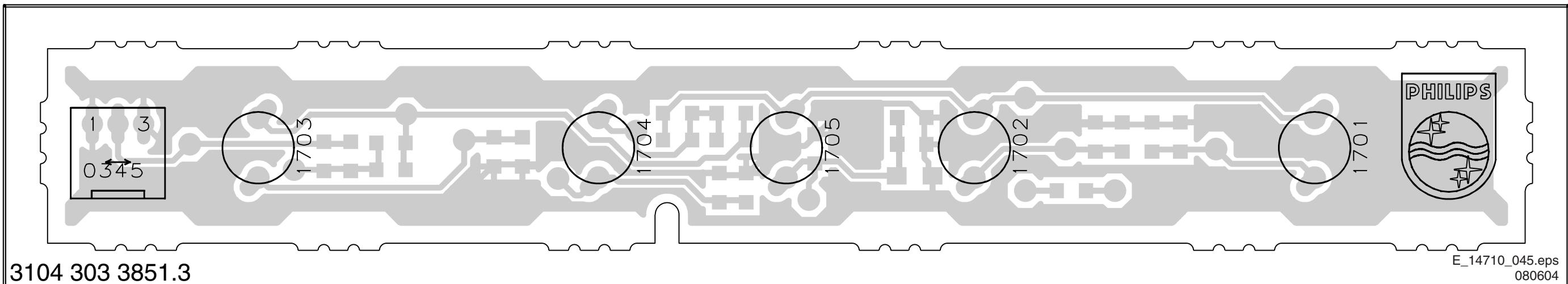
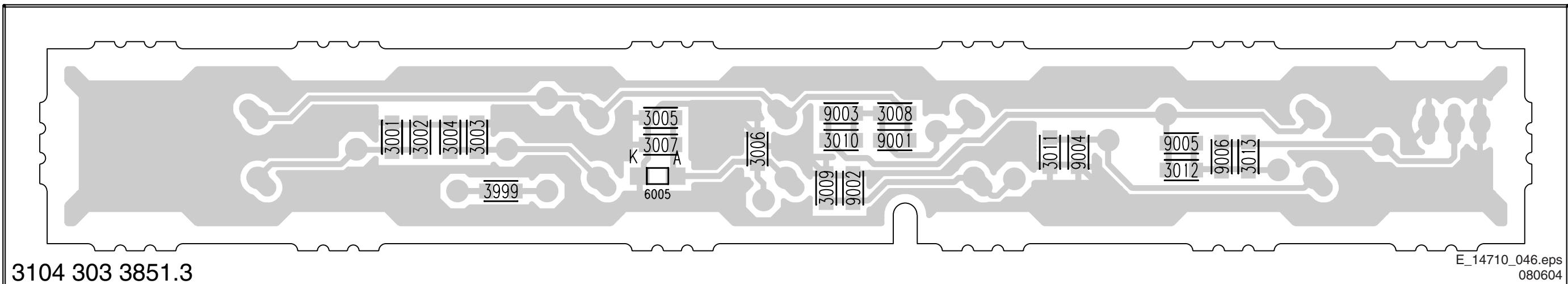


Top Control Panel

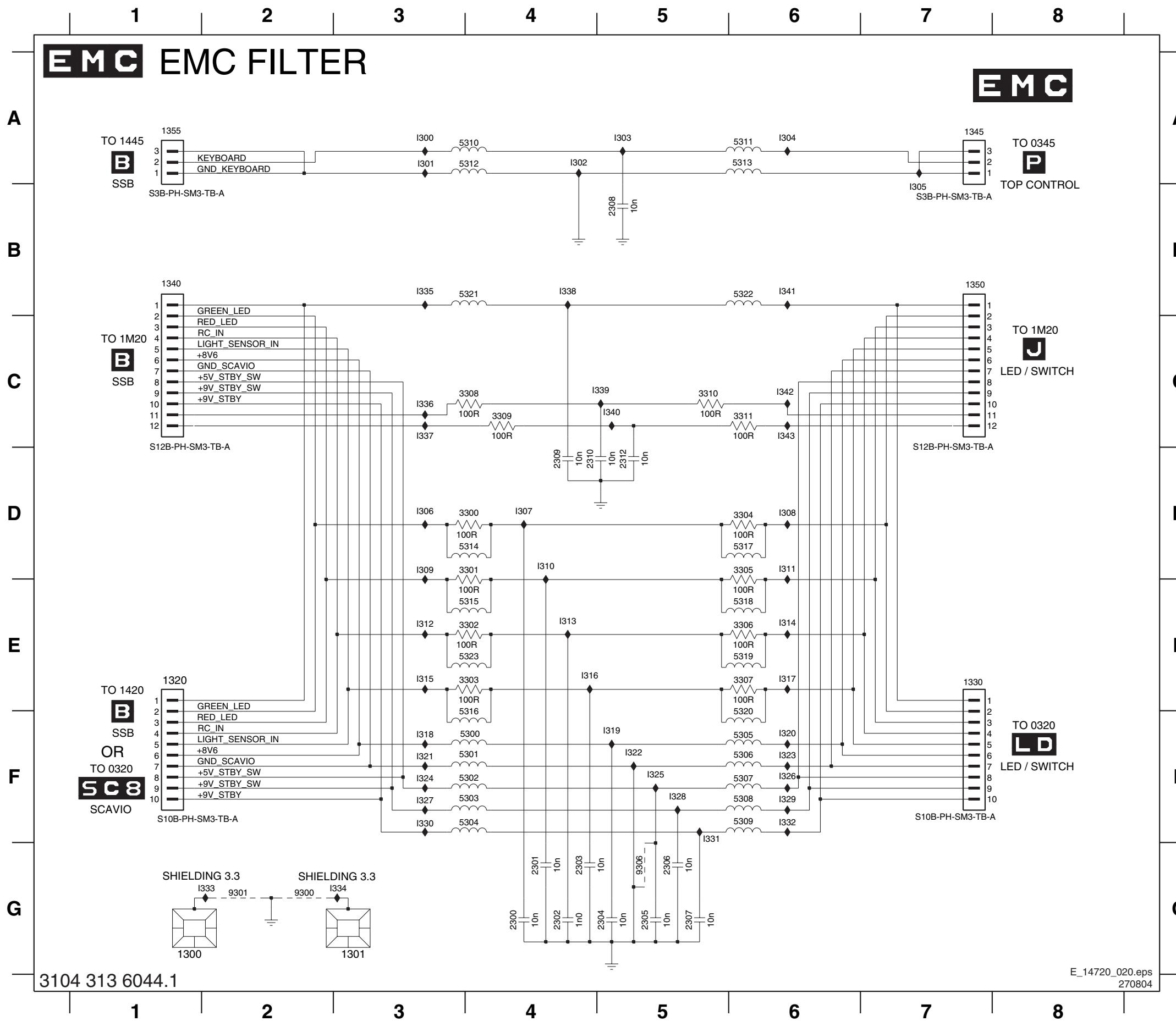


Layout Top Control Panel (Top Side)

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**Layout Top Control Panel (Top Side)**3001 3003 3005 3007 3009 3011 3013 6005 9002 9004 9006
3002 3004 3006 3008 3010 3012 3999 9001 9003 9005

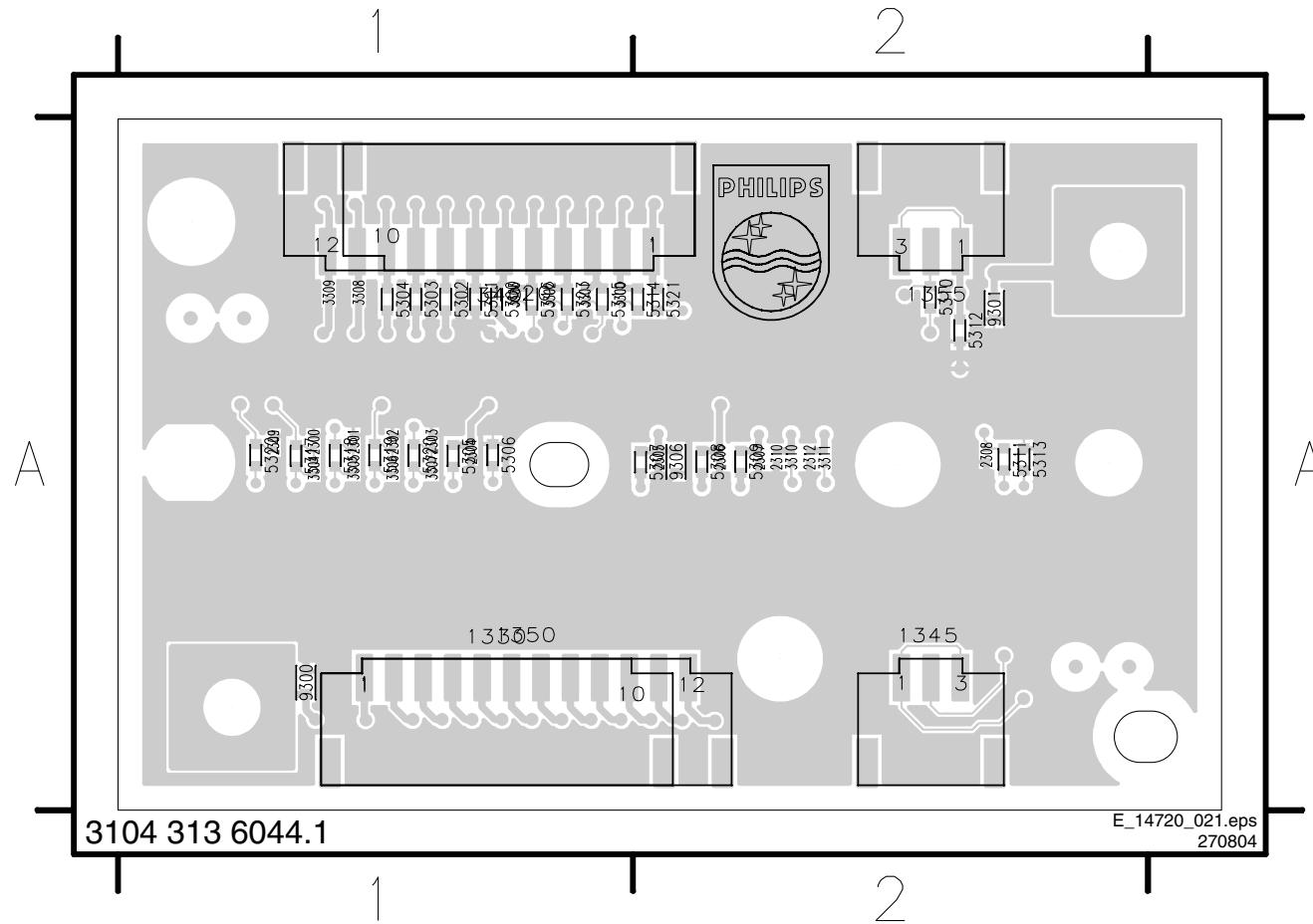
EMC Filter Panel



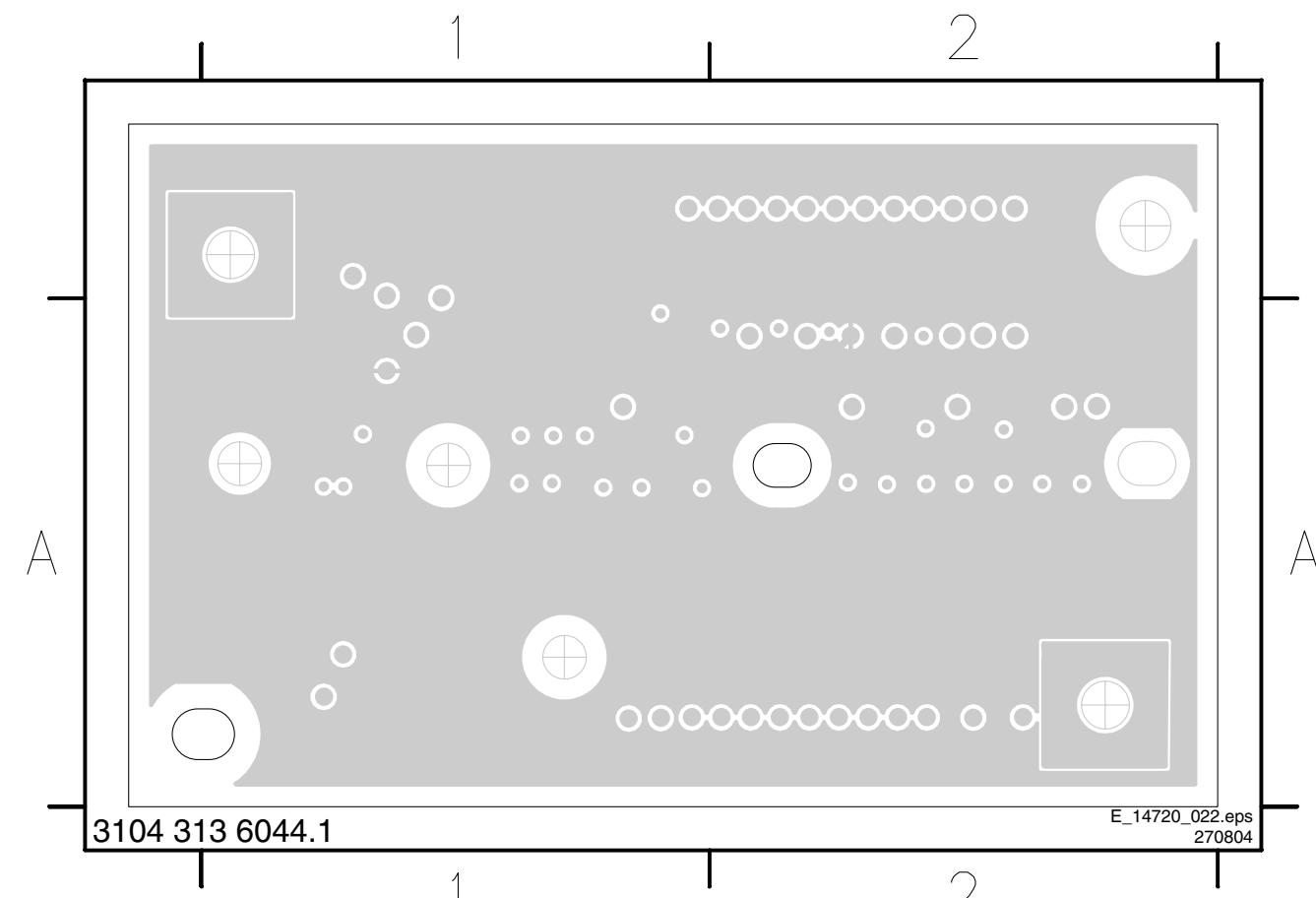
1300 G1	I315 E3
1301 G3	I316 E4
1320 E1	I317 E6
1330 E7	I318 F3
1340 B1	I319 F5
1345 A7	I320 F6
1350 B7	I321 F3
1355 A1	I322 F5
2300 G4	I323 F6
2301 G4	I324 F3
2302 G4	I325 F5
2303 G4	I326 F6
2304 G5	I327 F3
2305 G5	I328 F5
2306 G5	I329 F6
2307 G5	I330 F3
2308 B5	I331 F5
2309 D4	I332 F6
2310 D4	I333 G2
2312 D5	I334 G3
3300 D4	I335 B3
3301 D4	I336 C3
3302 E4	I337 C3
3303 E4	I338 B4
3304 D6	I339 C5
3305 D6	I340 C5
3306 E6	I341 B6
3307 E6	I342 C6
3308 C4	I343 C6
3309 C4	
3310 C5	
3311 C6	
5300 F4	
5301 F4	
5302 F4	
5303 F4	
5304 F4	
5305 F6	
5306 F6	
5307 F6	
5308 F6	
5309 F6	
5310 A4	
5311 A6	
5312 A4	
5313 A6	
5314 D4	
5315 E4	
5316 F4	
5317 D6	
5318 E6	
5319 E6	
5320 F6	
5321 B4	
5322 B6	
5323 E4	
9300 G2	
9301 G2	
9306 G5	
I300 A3	
I301 A3	
I302 A4	
I303 A5	
I304 A6	
I305 B7	
I306 D3	
I307 D4	
I308 D6	
I309 D3	
I310 D4	
I311 D6	
I312 E3	
I313 E4	
I314 E6	

Layout EMC Filter Panel (Top Side)

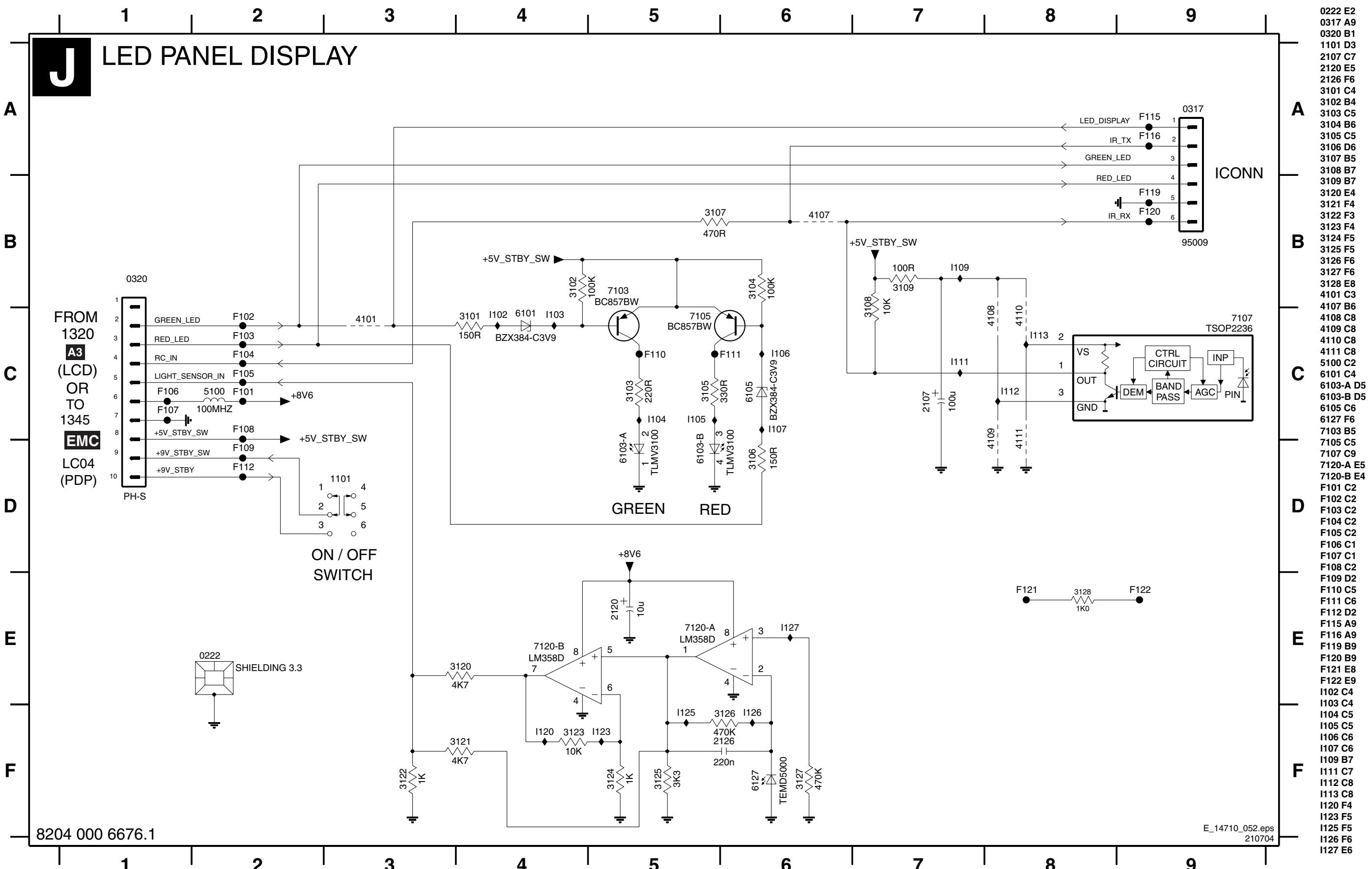
1320 A2	2301 A1	2308 A2	3303 A1	3310 A2	5305 A1	5312 A2	5319 A1	9306 A2
1330 A1	2302 A1	2309 A1	3304 A1	3311 A2	5306 A1	5313 A2	5320 A1	
1340 A1	2303 A1	2310 A2	3305 A1	5300 A1	5307 A2	5314 A2	5321 A2	
1345 A2	2304 A1	2312 A2	3306 A1	5301 A1	5308 A2	5315 A1	5322 A1	
1350 A1	2305 A2	3300 A1	3307 A1	5302 A1	5309 A2	5316 A1	5323 A1	
1355 A2	2306 A2	3301 A1	3308 A1	5303 A1	5310 A2	5317 A1	9300 A1	
2300 A1	2307 A2	3302 A1	3309 A1	5304 A1	5311 A2	5318 A1	9301 A2	



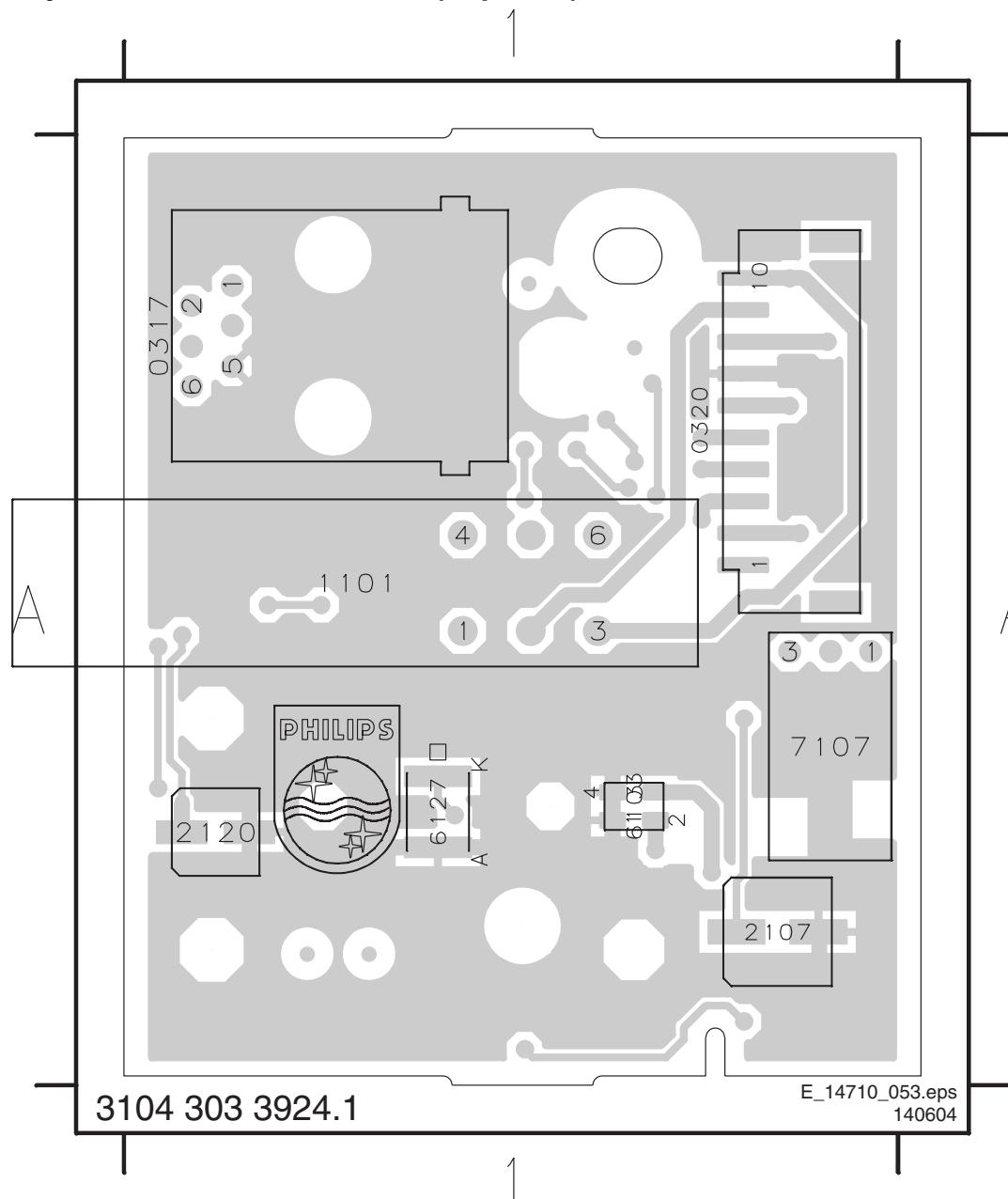
Layout EMC Filter Panel (Bottom Side)



Led and Switch Panel

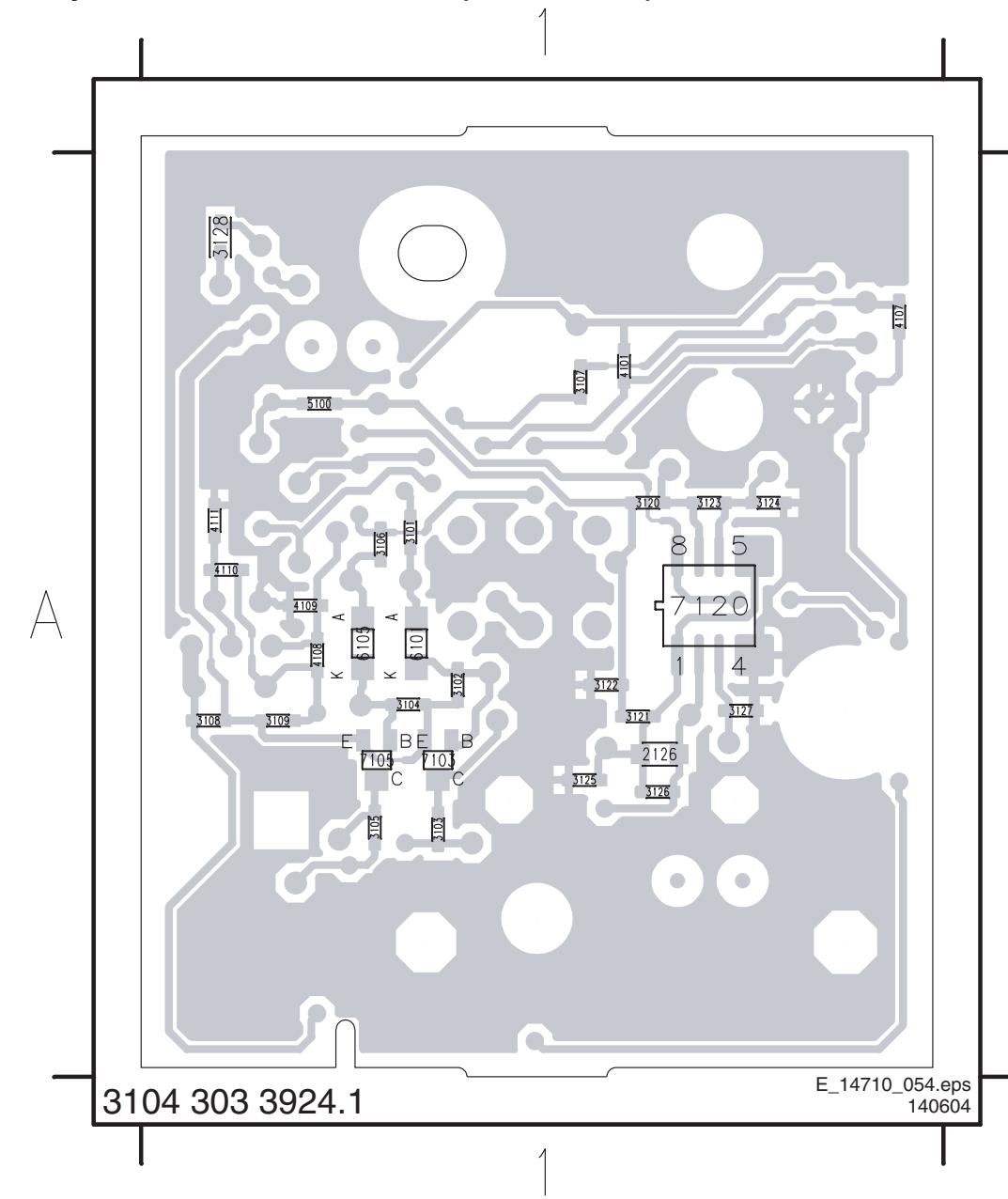


Layout Led and Switch Panel (Top Side)



0317 A1
0320 A1
1101 A1
2107 A1
2120 A1
6103 A1
6127 A1
7107 A1

Layout Led and Switch Panel (Bottom Side)



0317 A1
1101 A1
2126 A1
3101 A1
3102 A1
3103 A1
3104 A1
3105 A1
3106 A1
3107 A1
3108 A1
3109 A1
3120 A1
3121 A1
3122 A1
3123 A1
3124 A1
3125 A1
3126 A1
3127 A1
3128 A1
4101 A1
4107 A1
4108 A1
4109 A1
4110 A1
4111 A1
5100 A1
6101 A1
6105 A1
7103 A1
7105 A1
7107 A1
7120 A1

Personal Notes:

8. Alignments

Index of this chapter:

1. General alignment conditions
2. Hardware alignments
3. Software alignments
4. Option settings

Note: The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the Cursor Up, Down, Left or Right keys of the remote control transmitter.

8.1 General Alignment Conditions

8.1.1 Start Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage (depends on region):
 - EU: 230 V_{AC} / 50 Hz ($\pm 10\%$).
 - US: 120 V_{AC} / 60 Hz ($\pm 10\%$).
 - AP: 120 V_{AC} or 230 V_{AC} / 50 Hz ($\pm 10\%$).
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 15 minutes.
- Measure voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply).

Caution: never use heatsinks as ground.

- Test probe: $R_i > 10$ Mohm, $C_i < 20$ pF.
- Use an isolated trimmer/screwdriver to perform alignments.

8.1.2 Initial Settings

Perform all electrical adjustments with the following initial settings:

1. To avoid the working of the lightsensor, set "Active Control" to "Off" (via the "Active Control" button on the RC).
2. Set "Smart Picture" to "Natural" or "Soft" (via the "Smart Picture" button on the RC).

8.1.3 Alignment Sequence

- First, set the correct options:
 - In SAM, select OPTIONS,
 - Fill in the option settings according to the set sticker (see also paragraph "Option Settings"),
 - Store the OPTIONS by switching the set to STAND-BY.
- Warming up (>15 minutes).
- White-D alignment.

8.2 Hardware Alignments

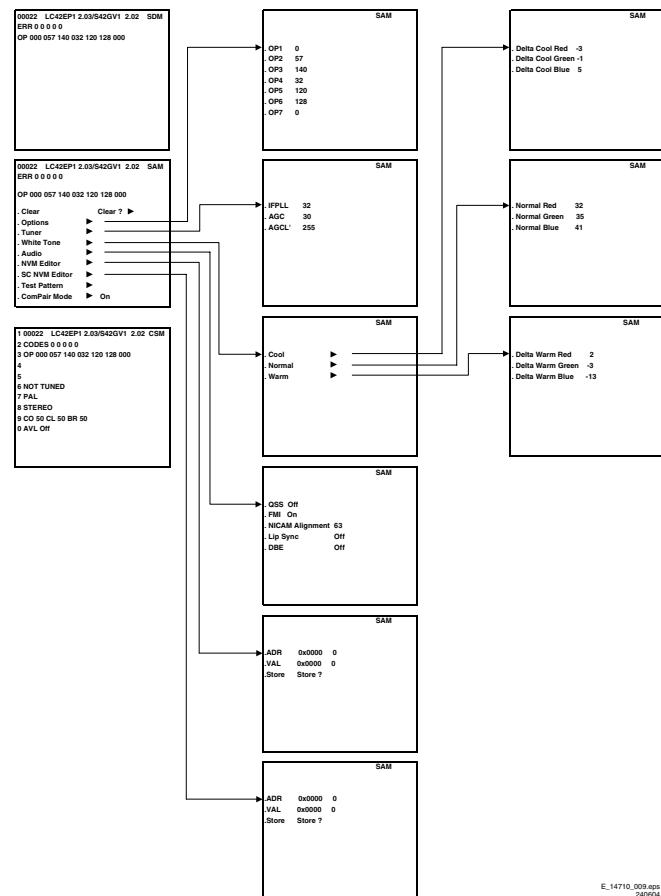
No hardware alignments necessary.

8.3 Software Alignments

With the software alignments of the Service Alignment Mode (SAM), Options can be set and the WHITE TONE, TUNER (IF) and AUDIO settings can be aligned.

To store the data: Use the RC button MENU to switch to the main menu and then switch to STAND-BY mode.

8.3.1 SAM Menu



E_14710_009.asc
240504

Figure 8-1 Overview SAM menu

8.3.2 White Tone

Method 1 (with color analyser):

Supply a 100% white uniformity test signal to the tuner. Enter SAM menu. Color features are switched "off" automatically.

Do **NOT** change the SMART PICTURE, ACTIVE CONTROL and CONTRAST+ settings, to prevent activating of Green Enhancement, Blue Stretch, and Black Stretch.

Offset values in NVM are used for HD-, HDMI- and VGA mode only the settings in TV mode need to be set.

Make the following settings in the normal user menu, when television is in TV Mode:

Table 8-1 Picture settings for white tone alignment

	AUO	LPL	PDP
Contrast	99	99	99
Brightness	42	44	44
Color	50	50	50

Set the following settings in SAM:

WHITE TONE - NORMAL RED to: Initial value.

WHITE TONE - NORMAL GREEN to: Initial value.

WHITE TONE - NORMAL BLUE to: Initial value.

Initial value is: 200 for LCD sets (LPL and AUO) and 180 for PDP sets.

Measure the RGB values with a color analyzer.

Leave the value with the lowest output on the initial value.

Align the normal white points, by lowering the other 2 colors, to the right x-y coordinates (see table "White Tone alignment values").

Note: Only lower the colors to prevent clipping!

Table 8-2 White Tone alignment values

Color temp. (K)	Normal All regions (8700)
X	0.289
Y	0.299

Note: Measure with a calibrated (phosphor-independent) color analyser in the centre of the screen. Use a contact less analyser (e.g. Minolta CA-210) to align the LCD TV. The color analyser may not touch the screen surface. Also, the measurement needs to be done in a dark environment.

The color analyser must be calibrated for the LCD or Plasma panel in question. See the manual of the color analyser for the procedure on how to perform this calibration.

Only the values for Normal are aligned with X, Y values. The delta values for COLD and WARM are given below.

Table 8-3 Fixed delta values

Screen Type		RED	GREEN	BLUE
PDP	Delta Cool	-6	-10	+5
	Delta Warm	+4	-5	-19
LCD LPL	Delta Cool	-8	-12	+3
	Delta Warm	+2	-10	-21
LCD AUO	Delta Cool	-3	-12	+10
	Delta Warm	+5	-5	-20

After the alignment is finished, switch the set to STANDBY, in order to store the alignments. When disconnecting the power before doing this, the settings will not be stored.

Method 2 (without color analyser):

If you do not have a color analyser, you can use the default values. These values are based on the average values in production.

- Set the values for the NORMAL color temperature. Given in the table "Average statistical values for "NORMAL" from production.
- Set the delta values for the COOL and WARM mode. See table: "Fixed delta values."
- After the alignment is finished, switch the set to STANDBY, in order to store the alignments. When disconnecting the power before doing this, the settings will not be stored.

Table 8-4 Average statistical values for "NORMAL" from production.

Screen type		RED	GREEN	BLUE
PDP	Normal	???	???	???
LCD LPL	Normal	???	???	???
LCD AUO	Normal	???	???	???
Values are valid for all regions				

Recently a new and more accurate method to perform this alignment has been introduced. Therefore there are no statistical values available yet. When available they will be published in an update manual.

8.3.3 Tuner Adjustment

AGC (RF AGC Take Over Point)

Set pattern generator (e.g. PM5580) with colour bar pattern and connect to aerial input with RF signal amplitude - 10mV and set frequency for PAL/SECAM to 475.25 MHz. For France select the L'-signal.

- Activate the SAM-menu. Go to the sub-menu TUNER, select the sub-menu option AFC WINDOW and adjust the value to "100 kHz".
- Select the AGC sub-menu.
- Connect a DC multi-meter to test point F306 or pin1 of the tuner.
- Adjust the AGC until the voltage at pin 1 of the tuner is 3.3 V +0.5 / -1.0.
- The value can be increased or decreased by pressing the RIGHT/LEFT cursor button on the RC.
- Switch the set to STAND-BY to store the data.

8.3.4 Grey Scale Adjustment

SDTV Grey Scale Adjustment

Equipment and setting

- E.g. Fluke 54200 or Philips PM5580.
- 100% "8-step grey scale" pattern.

Alignment Method

- Switch with the RC to TV mode,
- Press the MUTE button on RC,
- Set SMART PICTURE to SOFT mode,
- Activate the auto colour function by pressing key-sequence:
"INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results

- Visual check if the 8 Grey levels are correct.

Analog PC Grey Scale Adjustment

Equipment and setting

- Quantum Data 802B.
- PC input signal, with 64 levels Grey scale pattern, 1024x768 @ 60Hz (Format= 81:DMT1060, Pattern= 123:Grey 64).
- PC input at D-sub VGA connector.

Alignment Method

- Switch with the RC to PC mode.
- Press the MUTE button on RC.
- Set BRIGHTNESS and CONTRAST to nominal "50".
- Activate the auto colour function by pressing key-sequence:
"INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results

- Visual check if the 64 Grey levels are correct.

HD Grey Scale Adjustment

Equipment and setting

- Quantum Data 802B.
- HD input signal, Top half 100% colour bar and bottom half Grey scale pattern, 1920x1080i@60Hz YPbPr (Format= 1080i30, Pattern= HBar100).
- HD input at D-sub VGA connector.

Alignment Method

- Switch with the RC to HD mode.
- Press the MUTE button on RC.

- Activate the auto colour function by pressing key-sequence:
"INFO - MUTE - MUTE - MUTE - INFO - MENU - INFO".

Expected Results

- Visual check if Colour bar tint and Grey scale is correct.

8.3.5 Sound

No adjustments needed for sound.

8.3.6 Options

Options are used to control the presence/absence of certain features and hardware.

How to change an Option Byte

An Option Byte represents a number of different options. Changing these bytes directly makes it possible to set all options very fast. All options are controlled via seven option bytes. Select the option byte (OP1.. OP7) with the cursor UP/DOWN keys, and enter the new value.

Leaving the OPTION sub menu saves the changes in the Option Byte settings. Some changes will only take effect after the set has been switched "off" and "on" with the AC power switch (cold start).

Table 8-5 Option codes (general overview for all regions and displays)

Bit (DEC)	Option	Description	/61 (AP)	/69 (AP)	/93 (AP)	/00 (EU)	/37 (US)	Remarks
7 (128)	OP_PHILIPS_TUNER	Philips Tuner available	1	1	1	1	1	
6 (64)	OP_FM_RADIO	FM Radio available	0	0	0	0	0	
5 (32)	OP_LNA	Low Noise Amplifier available	0	0	0	0	0	
4 (16)	OP_ATS	Auto Tuning System	0	0	0	1	0	
3 (8)	OP_ACI	ACI	0	0	0	1	0	
2 (4)	OP_UK_PNP	After virgin = English + Great Britain	0	0	0	0	0	
1 (2)	OP_VIRGIN_MODE	Activate Plug & Play menu at start-up	0	0	0	0	0	
0 (1)	OP_CHINA	AP-PAL tuning algorithm for China	0	0	1	0	0	
OP1:			128	128	129	152	128	
7 (128)	OP_SMART_SOUND	Four smart sound settings	1	1	1	1	1	
6 (64)	OP_UI_GREEN	UI for Magnavox sets (NAFTA)	0	0	0	0	0	
5 (32)	OP_CHANNEL_NAMING	Naming of channel feature available	1	1	1	0	1	
4 (16)	OP_LTI	Histogram algorithm available (TDA9178)	1	1	1	1	1	
3 (8)	OP_TILT	Picture Rotation available	0	0	0	0	0	
2 (4)	OP_FINE_TUNING	Fine Tuning algorithm available	1	1	1	1	1	
1 (2)	OP_PIP_PHILIPS_TUNER	PIP Philips tuner	0	0	0	0	0	
0 (1)	OP_HUE	Tint for NTSC transmission	1	0	0	0	1	
OP2:			181	180	180	148	181	
7 (128)	OP_EW_FUNCTION	Geometry adj. for Large screen sets	0	0	0	0	0	
6 (64)	OP_2TUNER_PIP	Double Tuner for PIP available	0	0	0	0	0	
5 (32)	OP_PIP_SPLITTER	Not used	0	0	0	0	0	
4 (16)	OP_SPLITTER	Not used	0	0	0	0	0	
3 (8)	OP_VIRTUAL_DOLBY	Virtual Dolby Effect	1	1	1	1	1	
2 (4)	OP_WIDE_SCREEN	16:9 sets	1	1	1	1	1	
1 (2)	OP_WSSB	Wide Screen Signalling Bit detection	0	1	0	1	0	
0 (1)	OP_ECO_SUBWOOFER	Sub woofer available	0	0	0	0	0	
OP3:			12	14	12	14	12	
7 (128)	OP_LIP_SYNC	Lip Synchronisation Circuit available	0	0	0	0	0	Not for LCD
6 (64)	OP_NOTUSED2	Not used	0	0	0	0	0	
5 (32)	OP_ULTRA_BASS	Ultra Bass Boost available	0	0	0	0	0	
4 (16)	OP_DELTA_VOLUME	Delta Volume feature available	0	0	0	1	0	EU only
3 (8)	OP_NOTUSED3	Not used	0	0	0	0	0	
2 (4)	OP_NOTUSED4	Not used	0	0	0	0	0	
1 (2)	OP_STEREO_DBX	Stereo DBX for NTSC available	0	0	0	0	1	NTSC only
0 (1)	OP_STEREO_NICAM_2CS	Stereo NICAM 2CS available	0	1	0	1	0	
OP4:			0	1	0	17	2	
7 (128)	OP_AV1	External Source 1 available	1	1	1	1	1	
6 (64)	OP_AV2	External Source 2 available	1	1	1	1	1	
5 (32)	OP_AV3	External Source 3 (Side AV) available	1	1	1	1	1	
4 (16)	OP_CVI	Component Video In available	1	1	1	0	1	Not for EU
3 (8)	OP_SVHS2	Super Video Home System 2 available	0	0	0	0	0	
2 (4)	OP_SVHS3	Super Video Home System 3 available	0	0	0	0	0	
1 (2)	OP_HOTEL_MODE	LATAM specific simplified Hotel Mode	0	0	0	0	0	
0 (1)	OP_NOTUSED	Not used	0	0	0	0	0	
OP5:			240	240	240	224	240	
7 (128)	OP_PERSONAL_ZAPPING	Zapping of channels feature available	0	0	0	0	0	
6 (64)	OP_SMART_SURF	Surf List available	0	0	0	0	0	
5 (32)	OP_FMTRAP	FM trap available	0	0	0	0	0	
4 (16)	OP_COMBFILTER	comb filter available	1	1	1	1	1	Internal Hercules
3 (8)	OP_ACTIVE_CONTROL	Auto Picture Impr. feature available	1	1	1	1	1	
2 (4)	OP_SMART_LOCK	Toggle Child Lock & Lock Chan. enabled	1	1	1	1	1	
1 (2)	OP_LIGHT_SENSOR	Light Sensor enabled	1	1	1	1	1	
0 (1)	OP_TWIN_TEXT	2 txt pages on screen available	0	1	1	1	0	
OP6:			30	31	31	31	30	
7 (128)	OP_TIME_WIN1	1= 5 s, 0= 2 s (Europe fixed 1.2 s)	1	0	1	0	1	
4 (16)	OP_3DCOMB	3D comb filter available	1	0	0	0	1	NTSC only
AP-PAL								
3 (8)	OP_COLOR_SYSTEM_AP	1: Auto, PAL 4.43, NTSC 4.43, NTSC 3.58, SECAM 0: OFF- Auto, PAL 4.43, NTSC 4.43, NTSC 3.58	0	1	0	0	0	
2 (4)	OP_SOUND_SYSTEM_AP_1		1	1	1	0	0	
1 (2)	OP_SOUND_SYSTEM_AP_2		0	0	0	0	0	
0 (1)	OP_SOUND_SYSTEM_AP_3		0	0	0	0	0	
EUROPE								
3 (8)	OP_DUMMY6	Not used	0	0	0	0	0	
2 (4)	OP_DUMMY7	Not used	0	0	0	0	0	
1 (2)	OP_WEST_EU	West Europe Set (0 - East Europe Set) by default "on"	0	0	0	1	0	
0 (1)	OP_MULTI_STANDARD_EUR	For Europe multi standard set	0	0	0	1	0	
LATAM								
3 (8)	OP_DUMMY6	Not used	0	0	0	0	0	
2 (4)	OP_DUMMY7		0	0	0	0	0	
1 (2)	OP_SYSTEM_LT_1	00: NTSC-M, 01: NTSC-M, PAL-M, 10: NTSC-M, PAL-M, PAL-N, PAL-BG	0	0	0	0	0	
0 (1)	OP_SYSTEM_LT_2	11: NTSC-M, PAL-M, PAL-N, PAL-BG	0	0	0	0	0	
NAFTA & AP-NTSC								
3 (8)	OP_DUMMY6	Not used	0	0	0	0	0	
2 (4)	OP_DUMMY7	Not used	0	0	0	0	0	
1 (2)	OP_DUMMY8	Not used	0	0	0	0	0	
0 (1)	OP_DUMMY9	Not used	0	0	0	0	0	
OP7:			148	12	132	3	144	

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter

1. Introduction
2. Block Diagram
3. Power Supply
4. Input/Output
5. Tuner and IF
6. Video: TV Part
7. Video: Scaler Part
8. Audio Processing
9. Control
10. Display
11. Abbreviation List
12. IC Data Sheets

Note:

- Only **new** (not recently published) circuits are described here. For the other circuit descriptions, see a.o. the A02, FTL13, and FTL2.1 Service Manuals.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the wiring, block and circuit diagrams. Where necessary, you will find a separate drawing for clarification.

9.1 Introduction

The LC4.x is a global chassis for the year 2004. Its architecture is based upon the LC03 chassis (LC4.6 is LCD, LC4.7 is PDP). This chassis has the following (new) features:

- **Audio:** The sound processor is part of the UOC processor (called "Hercules").
- **Video:** Enhanced video features, video drivers, Active Control and multiple PIP.

The functions for video/audio processing, microprocessor (uP), and CC/Teletext (TXT) decoder are all combined in one IC (TDA120xx, item 7011), the so-called third generation Ultimate One Chip (UOC-III) or "Hercules". This chip has the following features:

- Control, small signal, mono/stereo, and extensive Audio/Video switching in one IC.
- Upgrade with digital sound & video processing.
- Alignment free IF.
- FM sound, no traps/bandpass filters.
- Full multi-standard color decoder.
- One Xtal reference for all functions (microprocessor, RCP, TXT/CC, RDS, color decoder, and stereo sound processor).

9.2 Block Diagram

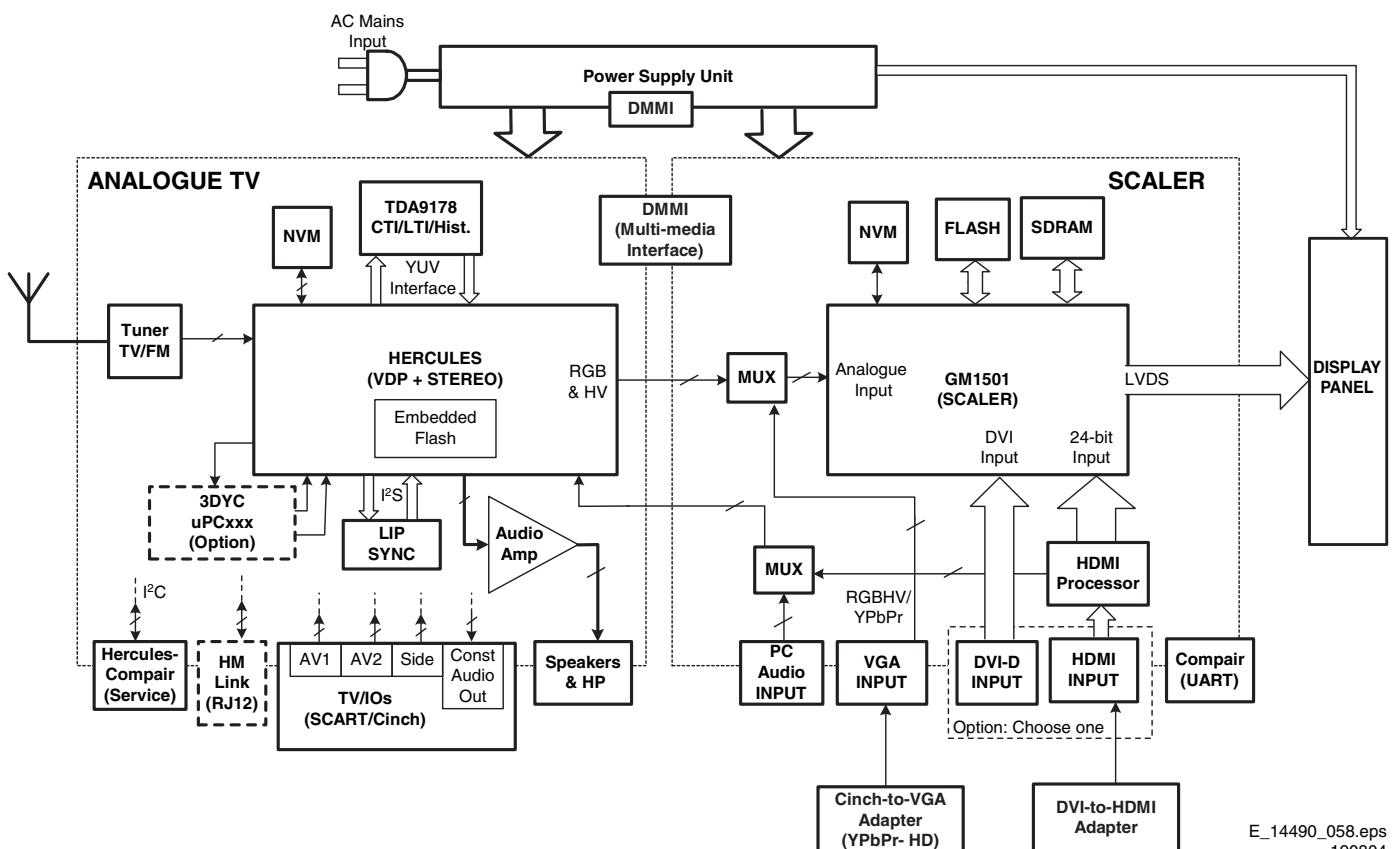


Figure 9-1 Block Diagram

The PLL tuner delivers the IF-signal, via audio & video SAW-filters, to the Video Signal Processor with FLASH embedded TEXT/Control/Graphics m-Controller (TCG m-Controller) and US Closed Caption decoder. TDA120x1 (item 7011, also called Hercules). This IC has the following functions:

- Analogue Video Processing.
- Sound Demodulation.
- Audio Interfaces and switching.
- Volume and tone control for loudspeakers.
- Reflection and delay for loudspeaker channels.
- Micro Controller.
- Data Capture.
- Display.

The Hercules has one input for the internal CVBS signal and a video switch with 3 external CVBS inputs and a CVBS output. All CVBS inputs can be used as Y-input for Y/C signals. However, only 2 Y/C sources can be selected because the circuit has 2 chroma inputs. It is possible to add an additional CVBS(Y/C input (CVBS/YX and CX) when the YUV interface and the RGB/YPRPB input are not needed. The I/O is divided over two parts: Rear I/O and Side I/O. The rear has two SCART inputs and a PC (VGA) input. The side has a CVBS and Y/C (SVHS) input.

The video part delivers the RGB signals to the Scaler IC.

The Genesis GM1501 Malibu Scaler IC can receive different video input signals: SDTV (from Hercules) or PC (VGA) (from external computer).

After the video processing, the digital data is send via a Low Voltage Differential Signalling bus to the display panel. LVDS is used to improve data speed and to reduce EMI significantly.

There are two I²C lines and two interrupt and communication lines (TV_IRQ and TV_SC_COM) for the Scaler control. The Scaler communicates with the Hercules as a slave device. To avoid buffer overflow at the Scaler side, the TV_SC_COM line provides the necessary hardware flow control. To allow bi-directional communication, the Scaler can initiate a service interrupt-request to the Hercules via the TV_IRQ line.

The Hercules, and EEPROM are supplied with 3.3 V, which is also present during STANDBY.

The EEPROMs, or NVMs (Non Volatile Memory) are used to store the settings.

The sound part is built up around the Hercules. The Source Selection, Decoding and Processing are all done by the Hercules.

Power supply input are several DC voltages coming from a supply panel.

9.3 Power Supply (SDI plasma panel)

See the FTP1.1 manual for a more detailed description.

9.3.1 Start-up sequence

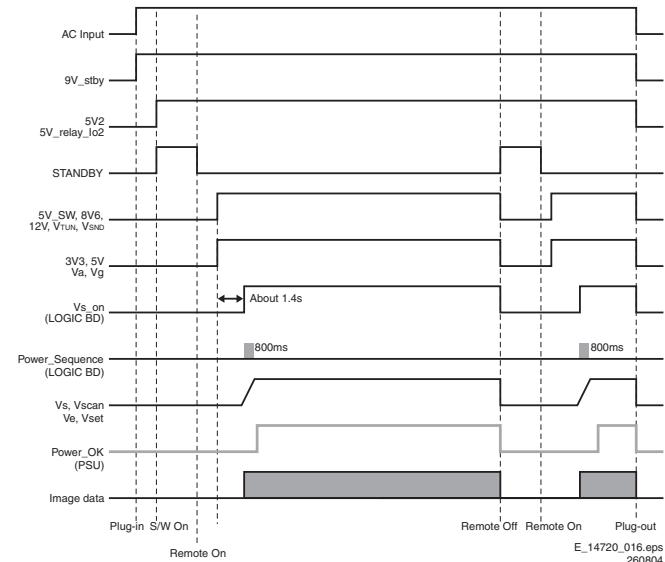


Figure 9-2 Start-up sequence SDI plasma panel

9.4 Input/Output

The I/O is divided over two parts: Rear I/O and Side I/O. The rear has two SCART inputs, a PC (VGA) input, and an Audio input. The side has a CVBS and Y/C (SVHS) input.

EXT1: The input of SCART1 is CVBS + RGB + L/R and the output is the video (+ sound) signal from the tuner (SC1_CVBS_RF_OUT).

EXT2: The input of SCART2 is Y/C + CVBS + L/R. The output signal is CVBS_SC2_MON_OUT (+ sound). SCART2 is meant for VCR and has therefore some additional signals in relation to EXT1 but no RGB: it has the possibility for Y/C_in: Y_in on pin 20 and Chroma_in on pin 15. The selection of the external I/O's is controlled by the Hercules.

PC (VGA) in: This input is directly going to the Scaler IC. See paragraph "Video: Scaler Part".

9.5 Tuner and IF

A Philips UV13xx Tuner is used in the TV board. The SIF signals are decoded by the Hercules. Tuning is done via I²C.

9.5.1 Video IF amplifier

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. One for filtering IF-video (1328) and one for IF-audio (1330). The type of these filters is depending of the standard(s) that has to be received.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 31 of the Hercules to pin 1 of the tuner. The AGC-detector operates on top sync and top white level. AGC take-over point is adjusted via the service alignment mode "Tuner" - "AGC". If there is too much noise in the picture, then it could be that the AGC setting is wrong. The AGC-setting could also be mis-aligned if the picture deforms with perfect signal; the IF-amplifier amplifies too much.

9.6 Video: TV Part (diagrams A1, A2, and A3)

The video processing is completely handled by the Hercules

- IF demodulator.
- Chrominance decoder
- Sync separator.
- Horizontal & vertical drive.
- RGB processing.
- CVBS and SVHS source select.

It has also build in features like:

- CTI.
- Black stretch.
- Blue stretch.
- White stretch.
- Slow start up.
- Dynamic skin tone correction etc.

Further, it also incorporates sound IF traps and filters, and requires only one crystal for all systems.

9.6.1 Histogram (YUV picture improvement) IC

The demodulated video-signal can be checked on pins 74, 75, and 76 of IC7011 and is fed to pins 70, 71, and 72. In this path, the Histogram IC TDA9171 is inserted.

This TDA9178 can control various picture improvements:

- Histogram processing.
- Colour transient improvement.
- Luminance transient improvement.
- Black and white stretch.
- Skin tone correction.
- Green enhancement.
- Blue stretch.
- Smart peaking.
- Video dependent coring.
- Colour dependent stretching.

Since the TDA9171 is connected to the Hercules, picture improvement works only for signals that are routed through the Hercules and not for signals directly connected to the Scaler.

9.7 Video: Scaler Part (diagram A7 and A13)

The Genesis GM1501 Scaler is a dual channel graphics and video processing IC for flat monitors and televisions incorporating Picture in Picture, up to SXGA output resolutions. The Scaler controls the display processing in a FTV, e.g. like the deflection circuit in a CRT-based TV. It controls all the view modes (e.g. like "zooming" and "shifting"). Features like PC (VGA) or HD inputs, are also handled by this part.

9.7.1 Features

The Scaler provides several key IC functions:

- Scaling.
- Auto-configuration/ Auto-Detection.
- Various Input Ports:
 - Analog RGB.
 - Video Graphics.
- Integrated LVDS Transmitter.
- On-chip Micro-controller

9.7.2 Inputs

Analog RGB

The RGB input is fed to pins B2, C2 and D2. This input consists of either the Hercules RGB output or the RGB/YpbPr input of the VGA connector. The Scaler can switch between the two signals via the PC_HD_SEL signal and selection IC SM5301.

PC (VGA) input

The VGA input is processed by the VGA block of the Scaler. The Scaler supports pixel frequencies up to 165MHz. YpbPr format is also supported via the VGA interface and covers resolutions of 480p/560p/720p/1080i.

9.7.3 Output

The Display Output Port provides data and control signals that permit the Scaler to connect to a variety of display devices using a TTL or LVDS interface. The output interface is configurable for single or dual wide TTL/LVDS in 18, 24 or 30-bit RGB pixels format. All display data and timing signals are synchronous with the DCLK output clock. The integrated LVDS transmitter is programmable to allow the data and control signals to be mapped into any sequence depending on the specified receiver format.

9.8 Audio Processing

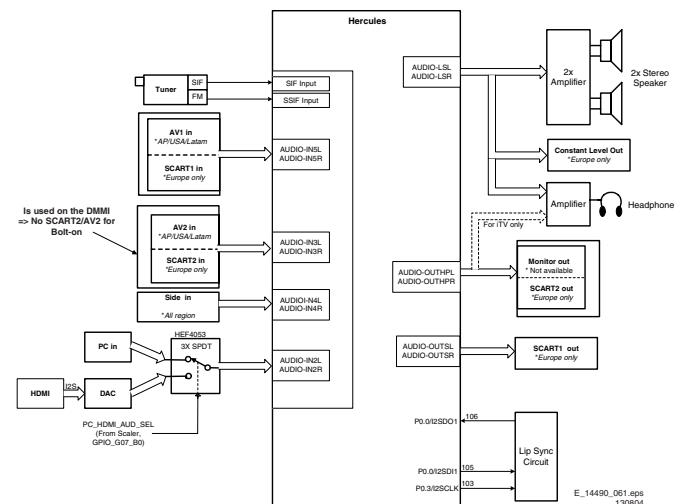


Figure 9-3 Block diagram audio processing

The audio decoding is done entirely via the Hercules. The IF output from the Tuner is fed directly to either the Video-IF or the Sound-IF input depending on the type of concept chosen. There are mainly two types of decoder in the Hercules, an analogue decoder that decodes only Mono, regardless of any standards, and a digital decoder (or DEMDEC) that can decode both Mono and Stereo, again regardless of any standards.

In this chassis, the analogue decoder is used in two cases:

- It is used for AM Sound demodulation in the Europe SECAM LL' transmission.
- It is used for all FM demodulation in AV-Stereo sets.

9.8.1 Diversity

The diversity for the Audio decoding can be broken up into two main concepts:

- The Quasi Split Sound concept used in Europe and some AP sets.
- The Inter Carrier concept, used in NAFTA and LATAM. The UOC-III family makes no difference anymore between QSS- and Intercarrier IF, nearly all types are software-switchable between the two SAW-filter constructions.

Simple data settings are required for the set to determine whether it is using the Inter Carrier or the QSS concept. These settings are done via the "QSS" and "FMI" bit found in SAM mode. Due to the diversity involved, the data for the 2 bits are being placed in the NVM location and it is required to write once during startup.

On top of that, it can be further broken down into various systems depending on the region. The systems or region chosen, will in turn affect the type of sound standard that is/are allowed to be decoded.

- For Europe, the standard consists of BG/DK/I/LL' for a Multi-System set. There are also versions for Eastern Europe and Western Europe and the standard for decoding will be BG/DK and I/DK respectively.
- For NAFTA and LATAM, there is only one transmission standard, which is the M standard. The diversity then will be based on whether it has a dBx noise reduction or a Non-dBx (no dBx noise reduction).
- For AP, the standard consists of BG/DK/I/M for a Multi-System set. The diversity here will depend on the region. AP China can have a Multi-System and I/DK version. For India, it might only be BG standard.

9.8.2 Functionality

The features available in the Hercules are as follows:

- Treble and Bass Control.
- Surround Sound Effect that includes:
 - Incredible Stereo.
 - Incredible Mono.
 - 3D Sound (not for AV Stereo).
 - TruSurround (not for AV Stereo).
 - Virtual Dolby Surround, VDS422 (not for AV Stereo).
 - Virtual Dolby Surround, VDS423 (not for AV Stereo).
 - Dolby Pro-Logic (not for AV Stereo).
- Bass Feature that includes:
 - Dynamic Ultra-Bass.
 - Dynamic Bass Enhancement.
 - BBE (not for AV Stereo).
- Auto-Volume Leveler.
- 5 Band Equalizer.
- Loudness Control.

All the features stated are available for the Full Stereo versions and limited features for the AV Stereo

9.8.3 Audio Amplifier Panel (diagram SA3)

Introduction

This panel contains the audio filters and amplifiers necessary for driving the speakers.

The audio inputs come from the SSB (via connector 1739). The PSU delivers the positive and negative supply voltage of 16 VDC.

After being filtered and amplified, the signals go to the speaker section, where the full range speakers are driven (load impedance is 8 ohm).

Amplifier

The amplifier is an integrated class-D amplifier (TDA7490). It combines a good performance with a high efficiency, resulting in a big reduction in heat generation.

Principle

Audio-power-amplifier systems have traditionally used linear amplifiers, which are well known for being inefficient. In fact, a linear Class AB amplifier is designed to act as a variable resistor network between the power supply and the load. The transistors operate in their linear region, and the voltage that is dropped across the transistors (in their role as variable resistors) is lost as heat, particularly in the output transistors. Class D amplifiers were developed as a way to increase the efficiency of audio-power-amplifier systems.

The Class D amplifier works by varying the duty cycle of a Pulse Width Modulated (PWM) signal.

By comparing the input voltage to a triangle wave, the amplifier increases duty cycle to increase output voltage, and decreases duty cycle to decrease output voltage.

The output transistors of a Class D amplifier switch from 'full off' to 'full on' (saturated) and then back again, spending very little

time in the linear region in between. Therefore, very little power is lost to heat. If the transistors have a low 'on' resistance (RDS(ON)), little voltage is dropped across them, further reducing losses.

A Low Pass Filter at the output passes only the average of the output wave, which is an amplified version of the input signal. In order to keep the distortion low, negative feedback is applied (via R3723/3708).

The advantage of Class D is increased efficiency (= less heat dissipation). Class D amplifiers can drive the same output power as a Class AB amplifier using less supply current. The disadvantage is the large output filter that drives up cost and size. The main reason for this filter is that the switching waveform results in maximum current flow. This causes more loss in the load, which causes lower efficiency. An LC filter with a cut-off frequency less than the Class D switching frequency, allows the switching current to flow through the filter instead of the load. The filter is less lossy than the speaker, which causes less power dissipated at high output power and increases efficiency in most cases.

Mute

A mute switch (item 7701) is provided at pin 6. This switch is controlled by the SOUND_ENABLE line from the Hercules (mute during operation).

Protections

Because of the symmetrical supply, a DC-blocking capacitor, between the amplifier and the speaker, is not necessary. However, it is still necessary to protect the speaker for DC voltages. Therefore, the following protections are therefore implemented:

- Via R3765 and R3767, each stabilised supply voltage line is checked on deviations.
- Via R3718 and 3717, each amplifier output is checked for DC-voltage.

9.9 Control

9.9.1 Hercules

The System Board has two main micro-controllers on board. These are:

- On-chip x86 micro-controller (OCM) from Genesis LCD TV/ Monitor Controller.
- On-chip 80C51 micro-controller from Philips Semiconductors UOCIII (Hercules) series.

Each micro-controller has its own I2C bus which host its own internal devices.

The Hercules is integrated with the Video and Audio Processor. For dynamic data storage, such as SMART PICTURE and SMART SOUND settings, an external NVM IC is being used. Another feature includes an optional Teletext/Closed Caption decoder with the possibility of different page storage depending on the Hercules type number.

The Micro Controller ranges in ROM from 128 kB with no TXT-decoder to 128 kB with a 10 page Teletext or with Closed Caption.

9.9.2 Block Diagram

The block diagram of the Micro Controller application is shown below.

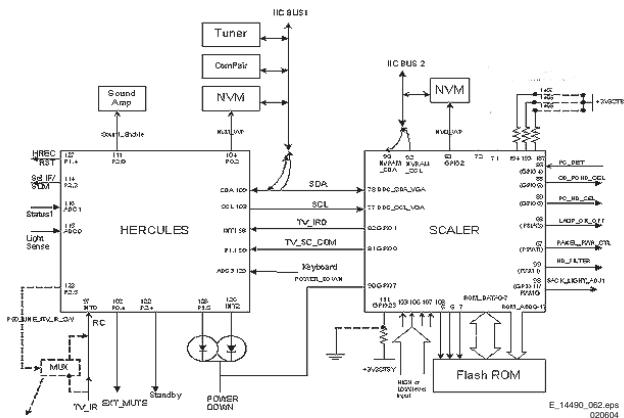


Figure 9-4 Micro Controller block diagram

9.9.3 Basic Specification

The Micro Controller operates at the following supply voltages:

- $+3.3 \text{ V}_{\text{DC}}$ at pins 4, 88, 94, and 109.
- $+1.8 \text{ V}_{\text{DC}}$ at pins 93, 96, and 117.
- I^2C pull up supply: $+3.3 \text{ V}_{\text{DC}}$.

9.9.4 Pin Configuration and Functionality

The ports of the Micro Controller can be configured as follows:

- A normal input port.
- An input ADC port.
- An output Open Drain port.
- An output Push-Pull port.
- An output PWM port.
- Input/Output Port

The following table shows the ports used for the L04 control:

Table 9-1 Micro Controller ports overview

Pin	Name	Description	Configuration
97	INT0/ P0.5	IR	INT0
98	P1.0/ INT1	TV_IRQ	INT2
99	P1.1/ T0	TV_SC_COM	P1.1
102	P0.4/ I2SWS	EXT_MUTE	P0.4
103	P0.3/ I2SCLK	Lip Sync	I2SCLK
104	P0.2/ I2SDO2	NVM_WP	P0.2
105	P0.1/ I2SDO1	Lip Sync	I2SDO1
106	P0.0/ I2SDI/O	Lip Sync	I2SDI/O
107	P1.3/ T1	PC-TV_LED	P1.3
108	P1.6/ SCL	SCL	SCL
109	P1.7/ SDA	SDA	SDA
111	P2.0/ TPWM	SOUND_ENABLE	P2.0
112	P2.1/ PWM0	(for future use)	-
113	P2.2/ PWM1	(for future use)	-
114	P2.3/ PWM2	SEL_IF	P2.3
115	P3.0/ ADC0	Light Sensor - SDM	ADC0
116	P3.1/ ADC1	STATUS_1	ADC1
119	P3.2/ ADC2	STATUS_2	ADC2
120	P3.3/ ADC3	KEYBOARD	ADC3
122	P2.4/ PWM3	STANDBY	P2.4
123	P2.5/ PWM4	(for future use)	-
126	P1.2/ INT2	(for future use)	-
127	P1.4/ RX	HERC_RESET	-
128	P1.5/ TX	POWER_DOWN	P1.5

The description of each functional pin is explained below:

- **LED.** This signal is used to drive the LED for Stand-by, Remote, and Error Indicator:
 - During protection mode, the LED blinks and the set is in Stand-by mode.
 - During error conditions it blinks at a predefined rate.
 - After receiving a valid RC or local keyboard command it flashes once.
 - For sets with error message indication, the LED blinks when message is active and the set is in Stand-by mode.
- **SCL.** This is the clock wire of the two-wire single master bi-directional I^2C bus.
- **SDA.** This is the data wire of the two-wire single master bi-directional I^2C bus.
- **STANDBY.** The Hercules generates this signal. This can enable the power supply in normal operation and disable it during Stand-by. It is of logic "high" (3.3 V) under normal operation and "low" (0 V) during Stand-by.
- **IR.** This input pin is connected to an RC5 remote control receiver.
- **SEL_IF.** This is an output pin to switch the Video SAW filter between M system and other systems.
 - 0: NTSC M (default).
 - 1: PAL B/G, DK, I, L.
- **NVM_WP.** The global protection line is used to enable and disable write protection to the NVM. When write to the NVM is required, pin 7 of the NVM must be pulled to logic "0" first (via Write_Protect of the micro-controller pin) before a write is performed. Otherwise pin 7 of NVM must always be at logic "1"
 - 0: Disabled.
 - 1: Enabled (default).
- **SOUND_ENABLE.** This pin is used to MUTE the audio amplifier. It is configured as push pull.
- **STATUS_1.** This signal is used to read the status of the SCART 1 input (EU only).
- **STATUS_2.** This signal is used to read the status of the SCART 2 input (EU only).
- **HERC_RESET.** This pin is used to switch the $+1.8 \text{ V}$ supply.
- **POWER_DOWN.** The power supply generates this signal. Logic "high" (3.3 V) under normal operation of the TV and goes "low" (0 V) when the Mains input voltage supply goes below 70 V_{AC} .
- **KEYBOARD.** Following are the Keyboard functions and the step values (8 bit) for it.

Table 9-2 Local keyboard values

Function	Voltage (V_{DC})	Step values (8 bit)
P+ / Ch+	0.43	7 - 33
P- / Ch-	0.93	54 - 73
Menu (Vol - and Vol +)	1.19	74 - 96
Vol -	1.49	97 - 121
Vol +	2.12	148 - 169

- **TV_IRQ.** This signal is the interrupt from the Scaler IC.
- **TV_SC_COM.** This signal is used for the communication with the Scaler IC.
- **EXT_MUTE.** This signal is used to reduce the switch "off" plop.

9.10 Abbreviation List

1080i	1080 visible lines, interlaced	FLASH	FLASH memory
1080p	1080 visible lines, progressive scan	FM	Field Memory / Frequency Modulation
2CS	2 Carrier Sound	FMR	FM Radio
2DNR	Spatial (2D) Noise Reduction	FRC	Frame Rate Converter
3DNR	Temporal (3D) Noise Reduction	FRONT-C	Front input chrominance (SVHS)
480i	480 visible lines, interlaced	FRONT-DETECT	Front input detection
480p	480 visible lines, progressive scan	FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
AARA	Automatic Aspect Ratio Adaptation: algorithm that adapts aspect ratio to remove horizontal black bars; keeping up the original aspect ratio	FTV	Flat TeleVison
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page	G-SC1-IN	Green SCART1 in
ADC	Analogue to Digital Converter	G-SC2-IN	Green SCART2 in
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	G-TXT	Green teletext
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box	H	H_sync to the module
AM	Amplitude Modulation	HD	High Definition
AP	Asia Pacific	HDMI	High Definition Multimedia Interface, digital audio and video interface
AR	Aspect Ratio: 4 by 3 or 16 by 9	HP	HeadPhone
ASD	Automatic Standard Detection	I	Monochrome TV system. Sound carrier distance is 6.0 MHz
AV	Audio Video	I ² C	Integrated IC bus
B-SC1-IN	Blue SCART1 in	I ² S	Integrated IC Sound bus
B-SC2-IN	Blue SCART2 in	IC	Integrated Circuit
B-TXT	Blue teletext	IF	Intermediate Frequency
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
BTSC	Broadcast Television System Committee	IR	Infra Red
C-FRONT	Chrominance front input	IRQ	Interrupt ReQuest
CBA	Circuit Board Assembly (or PWB)	Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
CL	Constant Level: audio output to connect with an external amplifier	LATAM	LATin AMerica
CLUT	Color Look Up Table	LC04	Philips chassis name for LCD TV 2004 project
ComPair	Computer aided rePair	LCD	Liquid Crystal Display
CSM	Customer Service Mode	LED	Light Emitting Diode
CVBS	Composite Video Blanking and Synchronisation	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
CVBS-EXT	CVBS signal from external source (VCR, VCD, etc.)	LS	LoudSpeaker
CVBS-INT	CVBS signal from Tuner	LVDS	Low Voltage Differential Signalling, data transmission system for high speed and low EMI communication.
CVBS-MON	CVBS monitor signal	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
CVBS-TER-OUT	CVBS terrestrial out	MOSFET	Metal Oxide Semiconductor Field Effect Transistor
DAC	Digital to Analogue Converter	MPEG	Motion Pictures Experts Group
DBE	Dynamic Bass Enhancement: extra low frequency amplification	MSP	Multi-standard Sound Processor: ITT sound decoder
DFU	Directions For Use: owner's manual	MUTE	MUTE Line
DNR	Dynamic Noise Reduction	NAFTA	North American Free Trade
DRAM	Dynamic RAM	NC	Association: Trade agreement between Canada, USA and Mexico
DSP	Digital Signal Processing	NICAM	Not Connected
DST	Dealer Service Tool: special (European) remote control designed for service technicians	NTSC	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, used mainly in Europe. National Television Standard Committee. Color system used mainly in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
DTS	Digital Theatre Sound	NVM	Non Volatile Memory: IC containing TV related data (for example, options)
DVD	Digital Versatile Disc	O/C	Open Circuit
DVI	Digital Visual Interface	ON/OFF LED	On/Off control signal for the LED
DW	Double Window	OSD	On Screen Display
EEPROM	Electrically Erasable and Programmable Read Only Memory	PAL	Phase Alternating Line. Color system used mainly in Western Europe (color
EU	EUrope		
EXT	EXTernal (source), entering the set by SCART or by cinches (jacks)		
FBL	Fast Blanking: DC signal accompanying RGB signals		
FBL-SC1-IN	Fast blanking signal for SCART1 in		
FBL-SC2-IN	Fast blanking signal for SCART2 in		
FBL-TXT	Fast Blanking Teletext		

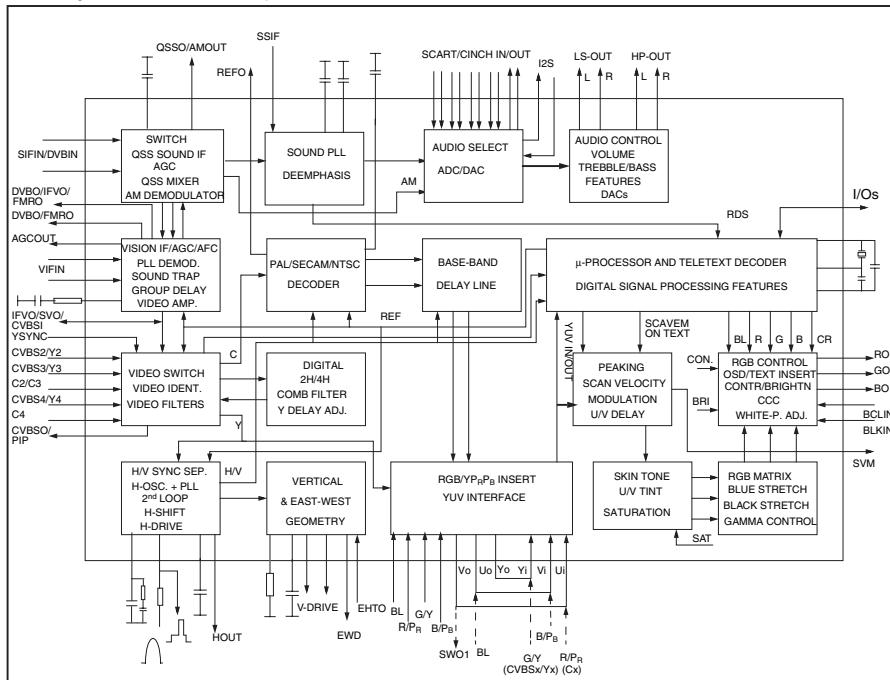
	carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
PC	Personal Computer	XTAL	Quartz crystal
PCB	Printed Circuit Board (or PWB)	YPbPr	Component video (Y= Luminance, Pb/Pr= Colour difference signals B-Y and R-Y, other amplitudes w.r.t. to YUV)
PDP	Plasma Display Panel		Video related signals: Y consists of luminance signal, blanking level and sync; C consists of colour signal.
PIG	Picture In Graphic	Y/C	Luminance-signal
PIP	Picture In Picture		Baseband component video (Y= Luminance, U/V= Color difference signals)
PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency	Y-OUT YUV	
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.		
PWB	Printed Wiring Board (or PCB)		
RAM	Random Access Memory		
RC	Remote Control transmitter		
RC5 (6)	Remote Control system 5 (6), the signal from the remote control receiver		
RGB	Red, Green, and Blue. The primary color signals for TV. By mixing levels of R, G, and B, all colors (Y/C) are reproduced.		
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync		
ROM	Read Only Memory		
SAM	Service Alignment Mode		
SIF	Sound Intermediate Frequency		
SC	SandCastle: two-level pulse derived from sync signals		
SC1-OUT	SCART output of the MSP audio IC		
SC2-B-IN	SCART2 Blue in		
SC2-C-IN	SCART2 chrominance in		
SC2-OUT	SCART output of the MSP audio IC		
S/C	Short Circuit		
SCL	Clock signal on I ² C bus		
SD	Standard Definition		
SDA	Data signal on I ² C bus		
SDM	Service Default Mode		
SDRAM	Synchronous DRAM		
SECAM	SEquence Couleur Avec Memoire. Color system used mainly in France and Eastern Europe. Color carriers = 4.406250 MHz and 4.250000 MHz		
SIF	Sound Intermediate Frequency		
SMPS	Switch Mode Power Supply		
SND	SouND		
SNDL-SC1-IN	Sound left SCART1 in		
SNDL-SC1-OUT	Sound left SCART1 out		
SNDL-SC2-IN	Sound left SCART2 in		
SNDL-SC2-OUT	Sound left SCART2 out		
SNDR-SC1-IN	Sound right SCART1 in		
SNDR-SC1-OUT	Sound right SCART1 out		
SNDR-SC2-IN	Sound right SCART2 in		
SNDR-SC2-OUT	Sound right SCART2 out		
SNDS-VL-OUT	Surround sound left variable level out		
SNDS-VR-OUT	Surround sound right variable level out		
SOPS	Self Oscillating Power Supply		
S/PDIF	Sony Philips Digital InterFace		
SRAM	Static RAM		
STBY	Stand-by		
SVHS	Super Video Home System		
SW	SubWoofer / SoftWare		
THD	Total Harmonic Distortion		
TXT	TeleteXT		
uP	Microprocessor		
VL	Variable Level out: processed audio output toward external amplifier		
VCR	Video Cassette Recorder		
VGA	Video Graphics Array		
WD	Watch Dog		

9.11 IC Data Sheets

This section shows the internal block diagrams and pin layouts of ICs that are drawn as "black boxes" in the electrical diagrams (with the exception of "memory" and "logic" ICs).

9.11.1 Diagram A2, Type TDA12029H (IC7011)

Block diagram of the “AV-stereo” TV processor with audio DSP



Pin configuration “stereo” and “AV-stereo” versions with Audio DSP

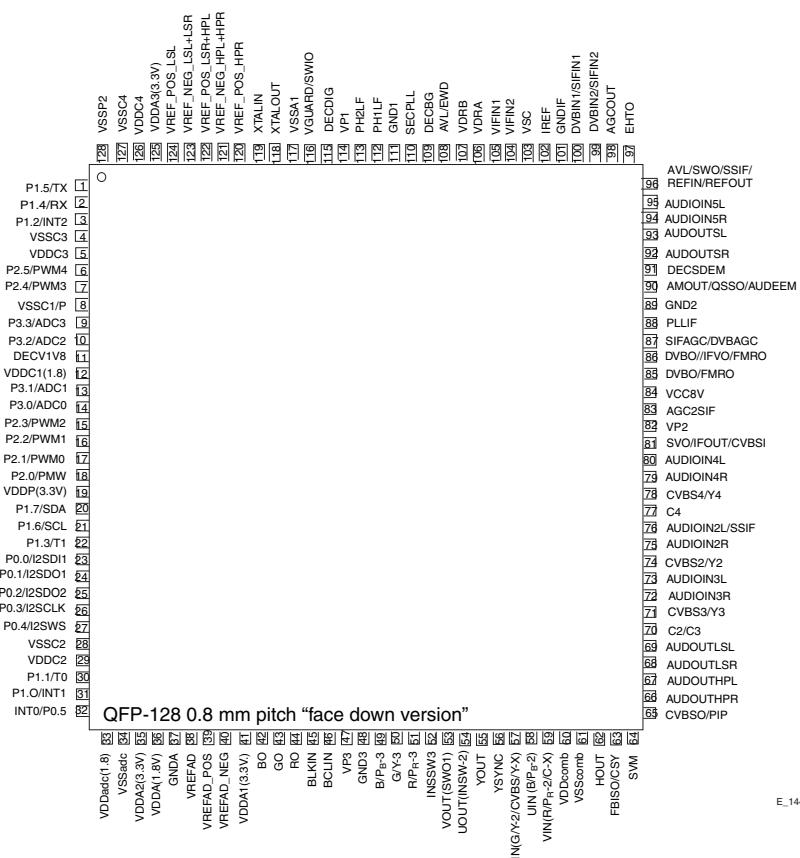
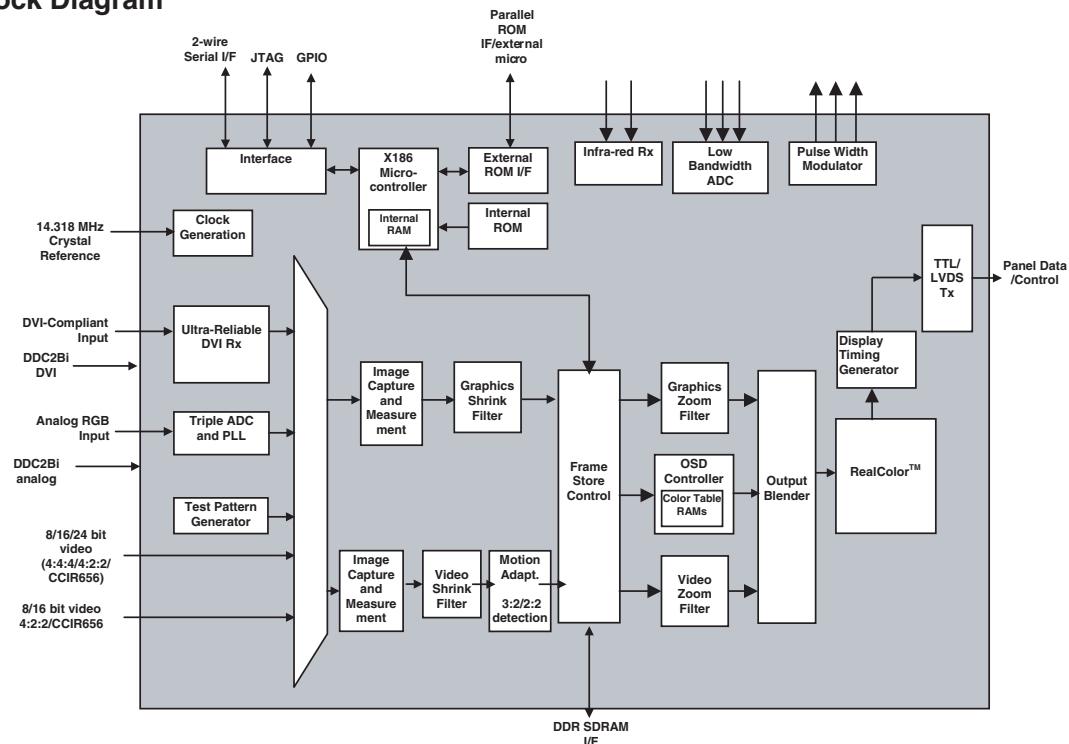


Figure 9-5 Internal Block Diagram and Pin Configuration

9.11.2 Diagram A7, Type GM1501 (IC7401)

Block Diagram



Pin Configuration

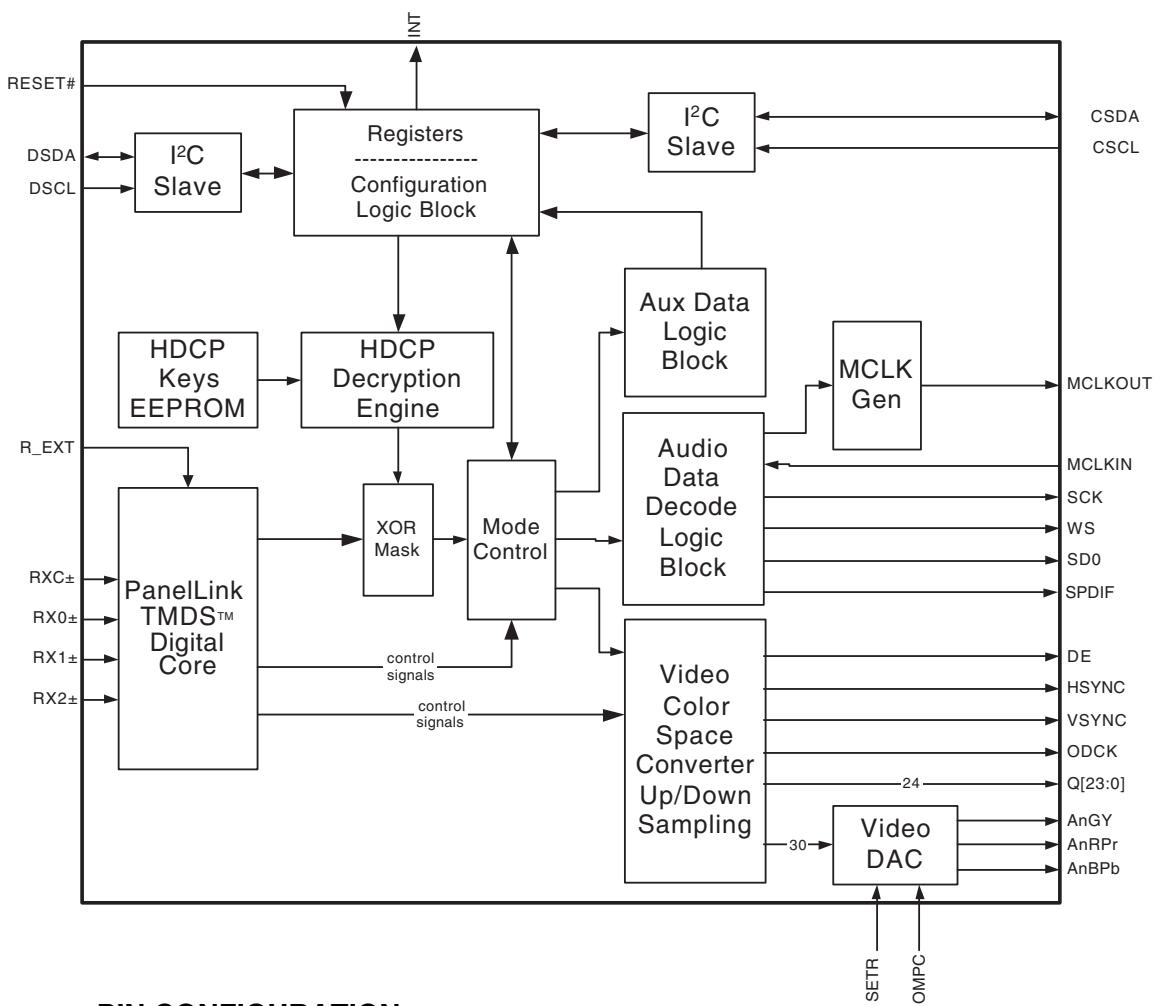
A	NC	ADC_3.3	ADC_1.8	ADC_1.8	ADC_DGND	RXC+	DVI_GND	RX0+	RX1+	RX2+	DVI_GND	LBADC_IN3	D_GND		
B	BLUE-	BLUE+	ADC_3.3	ADC_DGND	DVI_GND	RXC-	DVI_GND	RX0-	RX1-	RX2-	REXT	LBADC_IN2	D_GND		
C	GREEN-	GREEN+	SOG	ADC_AGN0	NC	DVI_3.3	DVI_GND	DVI_3.3	DVI_3.3	DVI_3.3	DVI_3.3	LBADC_IN1	LBADC_33		
D	RED-	RED+	ADC_3.3	ADC_AGN0	NC	DVI_1.8	DVI_GND	DVI_1.8	DVI_1.8	DVI_1.8	DVI_GND	LBADC_RETURN	LBADC_GND		
E	ADC_AGN0	ADC_AGN0	ADC_3.3	ADC_AGN0											
F	NC	VDD33_PLL	VSSA33_RPLL	VDDA33_RPLL											
G	VDDA33_FPLL	VSSD33_PLL	TCLK	XTAL											
H	VDD33_SDDS	VSSA33_SDDS	VDDA33_SDDS	VSSA33_FPLL											
J	VDD33_DDDS	VSSA33_DDDS	VDDA33_DDDS	VSSD33_SDDS											
K	RESETn	ACS_RSET_HD	NC	VSSD33_DDDS							CORE_1.8	CORE_1.8	D_GND		
L	OCM_INT2	OCM_INT1	AVSYNC	AHSYNC							D_GND	CORE_1.8	D_GND		
M	OCM_UDO	OCM_UDI	IR0	IR1							D_GND	D_GND	D_GND		
N	VGA_SDA	VGA_SCL	DVI_SDA	DVI_SCL							D_GND	D_GND	D_GND		
P	OCM_CS1n	OCM_CS2n	MSTR_SDA	MSTR_SCL							D_GND	D_GND	D_GND		
R	ROM_CSn	OCM_REn	OCM_WEn	EXTCLK							D_GND	D_GND	D_GND		
T	OCMADDR_17	OCMADDR_18	OCMADDR_19	OCM_CS0n							D_GND	CORE_1.8	D_GND		
U	OCMADDR_13	OCMADDR_14	OCMADDR_15	OCMADDR_16							CORE_1.8	CORE_1.8	D_GND		
V	OCMADDR_9	OCMADDR_10	OCMADDR_11	OCMADDR_12											
W	OCMADDR_6	OCMADDR_7	OCMADDR_8	IO_3.3											
Y	OCMADDR_3	OCMADDR_4	OCMADDR_5	IO_3.3											
AA	OCMADDR_0	OCMADDR_1	OCMADDR_2	IO_3.3											
AB	OCMDATA13	OCMDATA14	OCMDATA15	IO_3.3											
AC	OCMDATA10	OCMDATA11	OCMDATA12	IO_3.3	GPIO_G09_B2 (DEGRN0)	IO_3.3	DCLK	IO_3.3	GPIO_G07_B2 (DERED4)	IO_3.3	SHIELD[1] (DEGRN3)	LVDSB_3.3	LVDSB_GND		
AD	OCMDATA9	OCMDATA6	OCMDATA3	OCMDATA0	GPIO_G09_B0 (DERED0)	GPIO_G09_B4 (DEBLU0)	DEN	GPIO_G08_B5 (DOBLU1)	GPIO_G08_B3 (DORRN1)	GPIO_G07_B0 (DERED1)	GPIO_G07_B3 (DERED2)	GPIO_G07_B4 (DERED3)	SHIELD[2] (DEGRN4)	LVDSB_3.3	LVDSB_3.3
AE	OCMDATA8	OCMDATA5	OCMDATA2	OCMDATA1	GPIO_G09_B1 (DERED1)	GPIO_G09_B5 (DEBLU1)	GPIO_G08_B2 (DOGRN0)	GPIO_G08_B4 (DOBLU0)	GPIO_G07_B1 (DERED2)	GPIO_G07_B5 (DERED7)	GPIO_G07_B7 (DERED9)	SHIELD[3] (DEGRN5)	BC+	SHIELD[4] (DEBLU2)	
AF	OCMDATA7	OCMDATA4	OCMDATA1	OCMDATA0	GPIO_G09_B1 (DERED1)	GPIO_G09_B5 (DEBLU1)	GPIO_G08_B2 (DOGRN0)	GPIO_G08_B4 (DOBLU0)	GPIO_G07_B1 (DERED3)	GPIO_G07_B5 (DERED7)	GPIO_G07_B7 (DERED9)	SHIELD[0] (DEGRN2)	B3+	B3- (DEGRN7)	BC- (DEGRN9)

1 2 3 4 5 6 7 8 9 10 11 12 13
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Figure 9-6 Internal Block Diagram and Pin Configuration

9.11.3 Diagram A12, Type SiL9993CT (IC7808)

BLOCK DIAGRAM



PIN CONFIGURATION

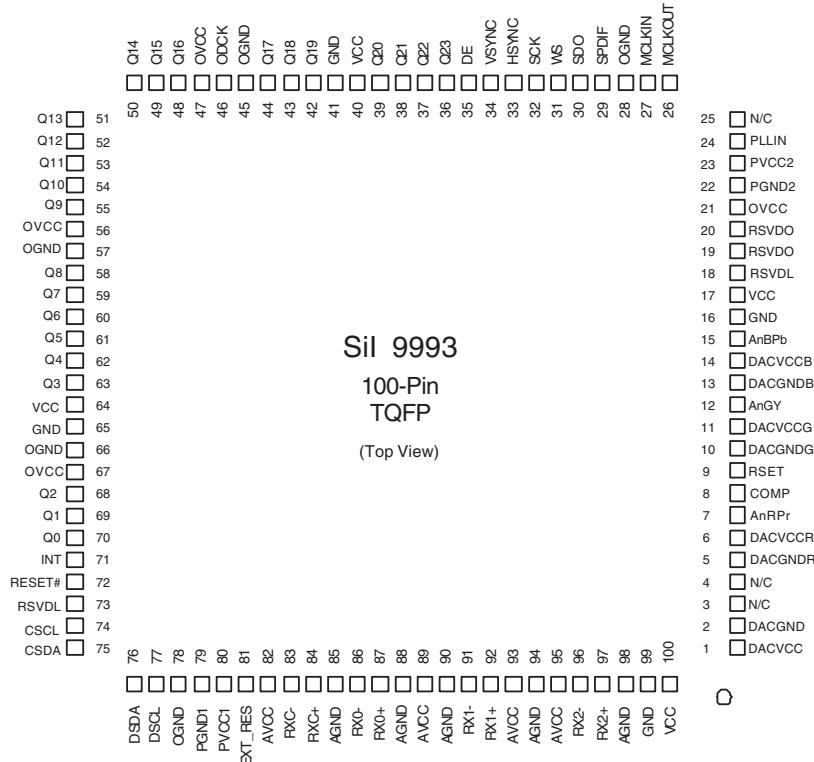


Figure 9-7 Internal Block Diagram and Pin Configuration

10. Spare Parts List

Set Level		2043	3198 035 71040	100nF 10% 16V 0402	2302	4822 122 33761	22pF 5% 50V	
Various		2044	2020 552 96718	220nF 10% 6.3V 0402	2303	4822 122 33761	22pF 5% 50V	
		2045	2238 869 15109	10pF 5% 50V 0402	2307	3198 024 44730	47nF 50V 0603	
		2046	2238 869 15109	10pF 5% 50V 0402	2308	3198 030 82280	2.2μF 20% 50V	
		2047	2020 552 96628	10nF 10% 16V 0402	2309	2020 021 91871	470μF 20% 16V	
1104▲	8204 000 77241	PDP S42SD-YDO5	2048	2238 869 15109	10pF 5% 50V 0402	2311	4822 124 12095	100μF 20% 16V
1104▲	8204 000 77261	PDP S37SD-YDO2	2049	2238 869 15109	10pF 5% 50V 0402	2321	5322 126 11583	10nF 10% 50V 0603
8303	3104 311 06691	Cable 10P/340/10P	2050	2238 869 15109	10pF 5% 50V 0402	2324	5322 126 11583	10nF 10% 50V 0603
8303	3104 311 08821	Cable 10P/400/10P	2051	2020 552 00002	3.3nF 2% 50V 0805	2355	3198 030 82280	2.2μF 20% 50V
8330	3104 311 06091	Cable 10p/680/10p	2053	2020 552 96618	1nF 10% 50V 0402	2356	3198 030 82280	2.2μF 20% 50V
8344	3104 311 07211	Cable 3P/560/3P	2054	2020 552 96632	22nF 10% 16V 0402	2357	3198 035 71040	100nF 10% 16V 0402
8346	3104 311 07001	Cable 11P/400/11P	2055	4822 126 14519	22pF 5% 50V 0402	2358	2020 552 96625	3.3nF 10% 50V 0402
8350	3104 311 08841	Cable 31P/220/31P	2056	3198 035 71040	100nF 10% 16V 0402	2359	2020 552 96628	10nF 10% 16V 0402
8352	3104 311 07381	Cable 9P/220/9P	2057	2238 869 15109	10pF 5% 50V 0402	2370	2020 552 96834	1μF 20% 6.3V 0402
		2058	2238 869 15109	10pF 5% 50V 0402	2371	2020 552 96834	1μF 20% 6.3V 0402	
Small Signal Panel [A]		2059	2238 869 15109	10pF 5% 50V 0402	2372	2020 552 96618	1nF 10% 50V 0402	
Various		2060	3198 035 71040	100nF 10% 16V 0402	2373	2020 552 96618	1nF 10% 50V 0402	
		2061	4822 124 23002	10μF 16V	2374	3198 035 71040	100nF 10% 16V 0402	
		2062	2238 869 15109	10pF 5% 50V 0402	2375	4822 124 12082	10μF 20% 50V	
		2063	3198 017 31540	150nF 10V 0603	2376	3198 017 41050	1μF 10V 0603	
		2064	3198 017 41050	1μF 10V 0603	2377	3198 017 41050	1μF 10V 0603	
		2067	2238 869 15109	10pF 5% 50V 0402	2378	2020 552 96718	220nF 10% 6.3V 0402	
		2068	2020 552 96718	220nF 10% 6.3V 0402	2380	4822 124 12095	100μF 20% 16V	
		2069	2238 869 15109	10pF 5% 50V 0402	2381	3198 035 71040	100nF 10% 16V 0402	
		2070	2020 552 96834	1μF 20% 6.3V 0402	2382	2020 021 91871	470μF 20% 16V	
		2071	4822 124 12095	100μF 20% 16V	2386	3198 017 41050	1μF 10V 0603	
		2072	4822 126 14076	220nF +80/-20% 25V	2387	4822 126 14324	33pF 5% 50V 0402	
		2073	2020 552 96618	1nF 10% 50V 0402	2388	4822 126 14324	33pF 5% 50V 0402	
1302▲	3139 147 19801	Tuner UV1318S/A IH -3	2074	2020 552 96718	220nF 10% 6.3V 0402	2392	3198 017 41050	1μF 10V 0603
		2076	2020 552 96718	220nF 10% 6.3V 0402	2394	3198 035 71040	100nF 10% 16V 0402	
		2077	2020 552 96834	1μF 20% 6.3V 0402	2395	3198 035 71040	100nF 10% 16V 0402	
		2078	2238 869 15101	100pF 5% 50V 0402	2396	4822 124 23002	10μF 16V	
		2079	2238 869 15109	10pF 5% 50V 0402	2397	2020 552 96834	1μF 20% 6.3V 0402	
		2080	2238 869 15109	10pF 5% 50V 0402	2398	2020 552 96834	1μF 20% 6.3V 0402	
		2081	2238 869 15109	10pF 5% 50V 0402	2401	4822 124 80151	47μF 16V	
		2082	2020 552 96618	1nF 10% 50V 0402	2402	4822 124 80151	47μF 16V	
		2084	2020 552 96718	220nF 10% 6.3V 0402	2403	3198 035 71040	100nF 10% 16V 0402	
		2085	2020 552 96618	1nF 10% 50V 0402	2404	3198 035 71040	100nF 10% 16V 0402	
		2086	2020 552 96618	1nF 10% 50V 0402	2405	3198 035 71040	100nF 10% 16V 0402	
		2087	2238 869 15109	10pF 5% 50V 0402	2406	3198 035 71040	100nF 10% 16V 0402	
		2088	2238 869 15109	10pF 5% 50V 0402	2407	3198 035 71040	100nF 10% 16V 0402	
		2089	2020 552 96618	1nF 10% 50V 0402	2408	3198 035 71040	100nF 10% 16V 0402	
		2090	2238 869 15109	10pF 5% 50V 0402	2409	3198 035 71040	100nF 10% 16V 0402	
		2091	2238 869 15109	10pF 5% 50V 0402	2410	3198 035 71040	100nF 10% 16V 0402	
		2092	2238 869 15109	10pF 5% 50V 0402	2411	3198 035 71040	100nF 10% 16V 0402	
		2093	2238 869 15109	10pF 5% 50V 0402	2412	3198 035 71040	100nF 10% 16V 0402	
		2094	2238 869 15109	10pF 5% 50V 0402	2413	3198 035 71040	100nF 10% 16V 0402	
		2095	2238 869 15109	10pF 5% 50V 0402	2414	3198 035 71040	100nF 10% 16V 0402	
		2096	2238 869 15109	10pF 5% 50V 0402	2415	3198 035 71040	100nF 10% 16V 0402	
		2097	2238 869 15109	10pF 5% 50V 0402	2416	3198 035 71040	100nF 10% 16V 0402	
		2098	2238 869 15109	10pF 5% 50V 0402	2417	4822 124 80151	47μF 16V	
		2099	2020 552 96618	1nF 10% 50V 0402	2418	4822 124 80151	47μF 16V	
		2101	4822 126 14241	330pF 0603 50V	2419	3198 035 71040	100nF 10% 16V 0402	
		2103	4822 126 14241	330pF 0603 50V	2420	3198 035 71040	100nF 10% 16V 0402	
		2104	2020 552 96807	1μF 10% 10V 0603	2421	3198 035 71040	100nF 10% 16V 0402	
		2105	4822 126 14241	330pF 0603 50V	2422	3198 035 71040	100nF 10% 16V 0402	
		2107	4822 126 14241	330pF 0603 50V	2423	3198 035 71040	100nF 10% 16V 0402	
		2108	2020 552 96807	1μF 10% 10V 0603	2424	3198 035 71040	100nF 10% 16V 0402	
		2109	4822 126 13881	470pF 5% 50V	2425	3198 035 71040	100nF 10% 16V 0402	
		2110	4822 126 13881	470pF 5% 50V	2426	3198 035 71040	100nF 10% 16V 0402	
		2111	4822 126 13881	470pF 5% 50V	2427	3198 035 71040	100nF 10% 16V 0402	
		2112	4822 126 13881	470pF 5% 50V	2428	3198 035 71040	100nF 10% 16V 0402	
		2127	4822 126 14241	330pF 0603 50V	2429	3198 035 71040	100nF 10% 16V 0402	
		2128	2020 552 96807	1μF 10% 10V 0603	2430	3198 035 71040	100nF 10% 16V 0402	
		2129	4822 126 14241	330pF 0603 50V	2431	3198 035 71040	100nF 10% 16V 0402	
		2131	4822 126 14241	330pF 0603 50V	2432	3198 035 71040	100nF 10% 16V 0402	
		2132	2020 552 96807	1μF 10% 10V 0603	2433	3198 035 71040	100nF 10% 16V 0402	
		2133	4822 126 14241	330pF 0603 50V	2434	4822 124 80151	47μF 16V	
		2134	4822 126 13881	470pF 5% 50V	2435	4822 124 80151	47μF 16V	
		2135	4822 126 13881	470pF 5% 50V	2436	3198 035 71040	100nF 10% 16V 0402	
		2136	4822 126 13881	470pF 5% 50V	2437	3198 035 71040	100nF 10% 16V 0402	
		2137	4822 126 13881	470pF 5% 50V	2438	3198 035 71040	100nF 10% 16V 0402	
		2138	3198 017 41050	1μF 10V 0603	2439	3198 035 71040	100nF 10% 16V 0402	
		2152	4822 126 14241	330pF 0603 50V	2440	3198 035 71040	100nF 10% 16V 0402	
		2155	4822 126 14241	330pF 0603 50V	2441	3198 035 71040	100nF 10% 16V 0402	
		2169	4822 124 23002	10μF 16V	2442	3198 035 71040	100nF 10% 16V 0402	
		2251	2238 869 15109	10pF 5% 50V 0402	2443	3198 035 71040	100nF 10% 16V 0402	
		2252	2238 869 15109	10pF 5% 50V 0402	2444	3198 035 71040	100nF 10% 16V 0402	
		2253	4822 124 23002	10μF 16V	2445	3198 035 71040	100nF 10% 16V 0402	
		2254	4822 124 23002	10μF 16V	2446	3198 035 71040	100nF 10% 16V 0402	
		2255	2238 869 15109	10pF 5% 50V 0402	2447	3198 035 71040	100nF 10% 16V 0402	
		2262	4822 124 80151	47μF 16V	2448	3198 035 71040	100nF 10% 16V 0402	
		2263	2020 552 96656	10μF 20% 25V 1210	2449	3198 035 71040	100nF 10% 16V 0402	
		2264	2020 552 96656	10μF 20% 25V 1210	2450	3198 035 71040	100nF 10% 16V 0402	
		2265	3198 035 02210	220pF 5% 50V 0402	2451	4822 124 80151	47μF 16V	
		2266	2020 552 96632	22nF 10% 16V 0402	2452	3198 035 71040	100nF 10% 16V 0402	
		2268	2020 012 93795	470μF 20% 16V	2453	3198 035 71040	100nF 10% 16V 0402	
		2269	2020 012 93795	470μF 20% 16V	2454	3198 035 71040	100nF 10% 16V 0402	
		2271	2020 552 96628	10nF 10% 16V 0402	2455	3198 035 71040	100nF 10% 16V 0402	

2456	3198 035 71040	100nF 10% 16V 0402	2632	2020 552 96834	1μF 20% 6.3V 0402	3022	4822 117 13606	10kΩ 5% 0.01W 0402
2461	3198 035 71040	100nF 10% 16V 0402	2633	2020 552 96834	1μF 20% 6.3V 0402	3023	4822 117 13601	22kΩ 5% 0402
2462	3198 035 71040	100nF 10% 16V 0402	2634	2020 552 96834	1μF 20% 6.3V 0402	3024	3198 031 01090	10Ω 5% 0.01W 0402
2463	3198 035 71040	100nF 10% 16V 0402	2635	2020 552 96834	1μF 20% 6.3V 0402	3025	3198 031 01090	10Ω 5% 0.01W 0402
2464	3198 035 71040	100nF 10% 16V 0402	2636	3198 035 71040	100nF 10% 16V 0402	3026	3198 031 06890	68Ω 5% 0402
2465	5322 124 41945	22μF 20% 35V	2681	2020 552 94427	100pF 5% 50V	3027	3198 031 01090	10Ω 5% 0.01W 0402
2466	3198 035 71040	100nF 10% 16V 0402	2686	2020 552 94427	100pF 5% 50V	3028	4822 117 11297	100kΩ 5% 0.1W
2467	3198 035 71040	100nF 10% 16V 0402	2688	2238 586 59812	100nF 20% 50V 0603	3029	4822 117 13548	1kΩ 5% 0402
2468	3198 035 71040	100nF 10% 16V 0402	2693	2238 586 59812	100nF 20% 50V 0603	3030	4822 117 11297	100kΩ 5% 0.1W
2469	3198 035 71040	100nF 10% 16V 0402	2698	2020 552 94427	100pF 5% 50V	3032	3198 031 02240	220kΩ 5% 0.1W 0402
2470	5322 124 41945	22μF 20% 35V	2699	2020 552 94427	100pF 5% 50V	3035	4822 117 13545	100Ω 1% 0402
2471	3198 035 71040	100nF 10% 16V 0402	2702	2020 552 96834	1μF 20% 6.3V 0402	3037	3198 031 04730	47Ω 5% 0402
2472	3198 035 71040	100nF 10% 16V 0402	2707	2020 021 91871	470μF 20% 16V	3038	3198 031 04730	47Ω 5% 0402
2473	3198 035 71040	100nF 10% 16V 0402	2708	2020 552 96834	1μF 20% 6.3V 0402	3040	3198 031 06830	68kΩ 5% 0.01W 0402
2474	3198 035 71040	100nF 10% 16V 0402	2710	3198 035 04710	470pF 50V 0402	3048	4822 117 13606	10kΩ 5% 0.01W 0402
2475	3198 035 71040	100nF 10% 16V 0402	2711	3198 035 04710	470pF 50V 0402	3049	4822 117 13545	100Ω 1% 0402
2476	3198 035 71040	100nF 10% 16V 0402	2713	2238 586 59812	100nF 20% 50V 0603	3050	4822 117 13545	100Ω 1% 0402
2477	3198 035 71040	100nF 10% 16V 0402	2714	2020 021 91871	470μF 20% 16V	3051	4822 117 13545	100Ω 1% 0402
2478	5322 124 41945	22μF 20% 35V	2715	2020 021 91871	470μF 20% 16V	3052	4822 117 13605	Jumper 0402
2479	3198 035 71040	100nF 10% 16V 0402	2719	2238 586 59812	100nF 20% 50V 0603	3056	3198 031 04720	4.7kΩ 5% 0402
2480	3198 035 71040	100nF 10% 16V 0402	2720	2238 869 15109	10pF 5% 50V 0402	3057	4822 117 13545	100Ω 1% 0402
2481	3198 035 71040	100nF 10% 16V 0402	2743	2020 552 96834	1μF 20% 6.3V 0402	3058	4822 117 13543	47Ω 5% 0402
2482	5322 124 41945	22μF 20% 35V	2744	2020 552 96834	1μF 20% 6.3V 0402	3059	4822 117 13548	1kΩ 5% 0402
2483	3198 035 71040	100nF 10% 16V 0402	2747	2238 869 15101	100pF 5% 50V 0402	3060	3198 031 03930	39kΩ 5% 0402
2484	3198 035 71040	100nF 10% 16V 0402	2748	2238 869 15101	100pF 5% 50V 0402	3063	3198 031 06890	68Ω 5% 0402
2485	3198 035 71040	100nF 10% 16V 0402	2749	2238 869 15101	100pF 5% 50V 0402	3065	3198 031 06810	680Ω 5% 0.01W 0402
2486	3198 035 71040	100nF 10% 16V 0402	2750	2238 869 15101	100pF 5% 50V 0402	3066	3198 031 06890	68Ω 5% 0402
2487	4822 126 14519	22pF 5% 50V 0402	2784	4822 126 14241	330pF 0603 50V	3067	3198 031 01090	10Ω 5% 0.01W 0402
2488	4822 126 14519	22pF 5% 50V 0402	2785	4822 126 14241	330pF 0603 50V	3068	3198 031 06890	68Ω 5% 0402
2490	2238 586 59812	100nF 20% 50V 0603	2847	3198 017 41050	1μF 10V 0603	3069	4822 117 13601	22kΩ 5% 0402
2491	2238 586 59812	100nF 20% 50V 0603	2848	3198 017 41050	1μF 10V 0603	3070	4822 117 13545	100Ω 1% 0402
2492	2238 586 59812	100nF 20% 50V 0603	2860	2238 869 15109	10pF 5% 50V 0402	3072	3198 031 06890	68Ω 5% 0402
2495	4822 124 80151	47μF 16V	2861	2238 869 15109	10pF 5% 50V 0402	3073	3198 031 01530	15kΩ 5% 0.01W 0402
2496	3198 035 71040	100nF 10% 16V 0402	2862	2238 869 15109	10pF 5% 50V 0402	3074	4822 117 11297	100kΩ 5% 0.1W
2501	4822 124 80151	47μF 16V	2863	2238 869 15109	10pF 5% 50V 0402	3075	3198 031 04720	4.7kΩ 5% 0402
2502	4822 124 11131	47μF 6.3V	2864	2238 869 15109	10pF 5% 50V 0402	3077	3198 031 04720	4.7kΩ 5% 0402
2503	3198 035 71040	100nF 10% 16V 0402	2865	2238 869 15109	10pF 5% 50V 0402	3078	3198 031 04720	4.7kΩ 5% 0402
2504	3198 035 71040	100nF 10% 16V 0402	2866	2238 869 15109	10pF 5% 50V 0402	3079	3198 031 04720	4.7kΩ 5% 0402
2505	3198 035 71040	100nF 10% 16V 0402	2867	2238 869 15109	10pF 5% 50V 0402	3080	5322 117 13034	1.5kΩ 1% 0.063W 0603
2506	3198 035 71040	100nF 10% 16V 0402	2868	2238 869 15109	10pF 5% 50V 0402	3081	4822 117 13545	100Ω 1% 0402
2507	3198 035 71040	100nF 10% 16V 0402	2869	2238 869 15109	10pF 5% 50V 0402	3082	3198 031 04720	4.7kΩ 5% 0402
2508	3198 035 71040	100nF 10% 16V 0402	2870	2238 869 15109	10pF 5% 50V 0402	3083	3198 031 04720	4.7kΩ 5% 0402
2509	3198 035 71040	100nF 10% 16V 0402	2871	2238 869 15109	10pF 5% 50V 0402	3084	4822 117 13545	100Ω 1% 0402
2510	3198 035 71040	100nF 10% 16V 0402	2872	2238 586 59812	100nF 20% 50V 0603	3085	3198 031 04720	4.7kΩ 5% 0402
2511	3198 035 71040	100nF 10% 16V 0402	2877	2238 869 15109	10pF 5% 50V 0402	3086	4822 117 13602	2.2kΩ 5% 0.01W 0402
2512	3198 035 71040	100nF 10% 16V 0402	2880	2238 869 15109	10pF 5% 50V 0402	3087	4822 117 13606	10kΩ 5% 0.01W 0402
2513	3198 035 71040	100nF 10% 16V 0402	2882	2238 869 15109	10pF 5% 50V 0402	3088	3198 031 03320	3.3kΩ 5% 0402
2514	3198 035 71040	100nF 10% 16V 0402	2883	2238 869 15109	10pF 5% 50V 0402	3089	3198 031 01540	150kΩ 5% 0402
2515	3198 035 71040	100nF 10% 16V 0402	2884	2020 552 96628	10nF 10% 16V 0402	3091	4822 117 13545	100Ω 1% 0402
2516	3198 035 71040	100nF 10% 16V 0402	2885	2238 869 15109	10pF 5% 50V 0402	3092	3198 031 04720	4.7kΩ 5% 0402
2517	3198 035 71040	100nF 10% 16V 0402	2886	4822 124 23002	10μF 16V	3093	3198 031 04720	4.7kΩ 5% 0402
2526	5322 124 41945	22μF 20% 35V	2887	2238 869 15109	10pF 5% 50V 0402	3094	3198 031 01090	10Ω 5% 0.01W 0402
2530	4822 124 23002	10μF 20% 16V	2889	2238 869 15109	10pF 5% 50V 0402	3096	3198 031 03320	3.3kΩ 5% 0402
2531	3198 035 71040	100nF 10% 16V 0402	2910	3198 035 04710	470pF 50V 0402	3097	3198 031 04720	4.7kΩ 5% 0402
2532	3198 035 71040	100nF 10% 16V 0402	2911	3198 030 72290	22μF 20% 35V	3098	4822 117 13545	100Ω 1% 0402
2533	3198 035 71040	100nF 10% 16V 0402	2920	4822 124 80151	47μF 16V	3101	4822 051 30151	150Ω 5% 0.062W
2560	3198 035 71040	100nF 10% 16V 0402	2921	4822 124 80151	47μF 16V	3102	4822 117 12891	220kΩ 1%
2561	4822 124 12095	100μF 20% 16V	2930	2020 021 91871	470μF 20% 16V	3103	4822 051 30223	22kΩ 5% 0.062W
2562	3198 035 71040	100nF 10% 16V 0402	2931	3198 035 04710	470pF 50V 0402	3104	4822 117 12925	47kΩ 1% 0.063W 0603
2563	3198 035 14720	4.7nF 5% 25V 0402	2933	2020 021 91871	470μF 20% 16V	3105	4822 051 30151	150Ω 5% 0.062W
2564	2020 552 96656	10μF 20% 25V 1210	2934	2020 552 96793	4.7nF 10% 50V 0402	3106	4822 117 12891	220kΩ 1%
2580	3198 035 71040	100nF 10% 16V 0402	2935	2020 021 91871	470μF 20% 16V	3107	4822 117 12925	47kΩ 1% 0.063W 0603
2581	3198 035 71040	100nF 10% 16V 0402	2953	2020 021 91871	470pF 20% 16V	3108	4822 051 30223	22kΩ 5% 0.062W
2582	3198 035 71040	100nF 10% 16V 0402	2955	3198 035 14720	4.7nF 5% 25V 0402	3109	4822 051 30759	75Ω 5% 0.062W
2583	3198 035 71040	100nF 10% 16V 0402	2956	3198 035 02210	220pF 5% 50V 0402	3110	4822 051 30331	330Ω 5% 0.062W
2584	3198 035 71040	100nF 10% 16V 0402	2957	2020 021 91871	470μF 20% 16V	3111	4822 051 30273	27kΩ 5% 0.062W
2585	2238 869 75829	82pF 5% 50V 0402	2958	2020 021 91871	470pF 20% 16V	3112	4822 051 30682	6.8Ω 5% 0.062W
2586	2238 869 75829	82pF 5% 50V 0402	2992	3198 035 71040	100nF 10% 16V 0402	3113	4822 051 30759	75Ω 5% 0.062W
2587	3198 035 03310	330pF 5% 50V 0402	2993	2020 552 96618	1nF 10% 50V 0402	3114	4822 051 30331	330Ω 5% 0.062W
2588	3198 035 04710	470pF 50V 0402	2994	2020 021 91871	470μF 20% 16V	3115	4822 051 30759	75Ω 5% 0.062W
2605	3198 035 71040	100nF 10% 16V 0402	2995	3198 035 71040	100nF 10% 16V 0402	3116	4822 051 30331	330Ω 5% 0.062W
2606	3198 035 71040	100nF 10% 16V 0402	2996	4822 124 80151	47μF 16V	3117	4822 051 30331	330Ω 5% 0.062W

3140	4822 051 30689	68Ω 5% 0.063W 0603	3437	4822 117 13606	10kΩ 5% 0.01W 0402	3713	4822 117 13606	10kΩ 5% 0.01W 0402
3141	4822 051 30102	1kΩ 5% 0.062W	3438	3198 031 11030	4 x 10kΩ 5% 1206	3716	3198 031 01220	1.2kΩ 5% 0.01W 0402
3142	4822 051 30331	330Ω 5% 0.062W	3439	3198 031 11030	4 x 10kΩ 5% 1206	3718	3198 031 03390	33Ω 1% 0402
3143	4822 051 30759	75Ω 5% 0.062W	3440	3198 031 11030	4 x 10kΩ 5% 1206	3721	3198 031 01220	1.2kΩ 5% 0.01W 0402
3144	4822 051 30151	150Ω 5% 0.062W	3441	3198 031 11030	4 x 10kΩ 5% 1206	3723	4822 117 13548	1kΩ 5% 0402
3145	4822 051 30151	150Ω 5% 0.062W	3442	3198 031 11030	4 x 10kΩ 5% 1206	3724	4822 117 13606	10kΩ 5% 0.01W 0402
3146	4822 051 30151	150Ω 5% 0.062W	3443	4822 117 13606	10kΩ 5% 0.01W 0402	3728	3198 031 05620	5.6kΩ 5% 0.01W 0402
3147	4822 051 30151	150Ω 5% 0.062W	3446	5322 117 13017	100Ω 1% 0.063W 0603	3729	3198 031 03320	3.3kΩ 5% 0402
3148	4822 051 30151	150Ω 5% 0.062W	3447	3198 031 02290	22Ω 5% 0.1W 0402	3730	3198 031 03320	3.3kΩ 5% 0402
3149	4822 051 30223	22kΩ 5% 0.062W	3448	3198 031 01090	10Ω 5% 0.01W 0402	3731	4822 117 13543	470Ω 5% 0402
3150	4822 051 30151	150Ω 5% 0.062W	3501	4822 117 12706	10kΩ 1% 0.063W 0603	3732	4822 117 13548	1kΩ 5% 0402
3151	4822 051 30151	150Ω 5% 0.062W	3502	4822 117 12706	10kΩ 1% 0.063W 0603	3733	4822 117 13543	470Ω 5% 0402
3152	4822 117 12891	220kΩ 1%	3503	2322 704 61501	150Ω 1% 0603	3739	4822 117 13601	22kΩ 5% 0402
3153	4822 051 30151	150Ω 5% 0.062W	3531	4822 117 13606	10kΩ 5% 0.01W 0402	3740	4822 117 13601	22kΩ 5% 0402
3155	4822 117 12891	220kΩ 1%	3532	4822 117 13606	10kΩ 5% 0.01W 0402	3741	4822 117 11297	100kΩ 5% 0.1W
3156	4822 051 30151	150Ω 5% 0.062W	3534	4822 117 13548	1kΩ 5% 0402	3742	4822 117 13601	22kΩ 5% 0402
3169	4822 051 30479	47Ω 5% 0.062W	3536	4822 117 13606	10kΩ 5% 0.01W 0402	3743	4822 117 13601	22kΩ 5% 0402
3251	4822 117 11151	1Ω 5%	3538	3198 031 11030	4 x 10kΩ 5% 1206	3745	4822 117 11297	100kΩ 5% 0.1W
3259	4822 117 13606	10kΩ 5% 0.01W 0402	3539	3198 031 11030	4 x 10kΩ 5% 1206	3752	3198 031 01510	150Ω 5% 0.01W 0402
3260	3198 031 06820	6.8kΩ 5% 0.01W 0402	3540	3198 031 11030	4 x 10kΩ 5% 1206	3753	3198 031 01510	150Ω 5% 0.01W 0402
3266	3198 031 04720	4.7kΩ 5% 0402	3544	3198 031 11030	4 x 10kΩ 5% 1206	3781	4822 117 12925	47kΩ 1% 0.063W 0603
3267	5322 117 13031	5.6kΩ 1% 0.063W 0603	3545	3198 031 11030	4 x 10kΩ 5% 1206	3782	4822 051 30151	150Ω 5% 0.062W
3268	2322 704 63302	3.3kΩ 1% 0603	3546	3198 031 11030	4 x 10kΩ 5% 1206	3783	4822 051 30103	10kΩ 5% 0.062W
3270	4822 117 13602	2.2kΩ 5% 0.01W 0402	3547	3198 031 11030	4 x 10kΩ 5% 1206	3784	4822 051 30102	1kΩ 5% 0.062W
3271	4822 117 13543	47Ω 5% 0402	3548	4822 117 13606	10kΩ 5% 0.01W 0402	3788	4822 051 30102	1kΩ 5% 0.062W
3273	3198 031 02240	220kΩ 5% 0.1W 0402	3549	4822 051 30102	1kΩ 5% 0.062W	3836	4822 117 13606	10kΩ 5% 0.01W 0402
3274	4822 117 13601	22kΩ 5% 0402	3550	4822 051 30102	1kΩ 5% 0.062W	3838	4822 117 13606	10kΩ 5% 0.01W 0402
3302	4822 051 30101	100Ω 5% 0.062W	3552	4822 051 30102	1kΩ 5% 0.062W	3870	3198 031 06890	68Ω 5% 0402
3303	4822 051 30101	100Ω 5% 0.062W	3553	4822 051 30102	1kΩ 5% 0.062W	3871	3198 031 06890	68Ω 5% 0402
3304	4822 117 13606	10kΩ 5% 0.01W 0402	3560	4822 117 11297	100kΩ 5% 0.1W	3877	3198 031 06890	68Ω 5% 0402
3305	4822 117 13606	10kΩ 5% 0.01W 0402	3561	4822 117 11297	100kΩ 5% 0.1W	3883	3198 031 06890	68Ω 5% 0402
3309	4822 117 13606	10kΩ 5% 0.01W 0402	3562	4822 117 11297	100kΩ 5% 0.1W	3885	3198 031 06890	68Ω 5% 0402
3311	4822 051 30103	10kΩ 5% 0.062W	3563	4822 117 13548	1kΩ 5% 0402	3886	4822 117 13606	10kΩ 5% 0.01W 0402
3319	4822 051 30273	27kΩ 5% 0.062W	3564	3198 031 01220	1.2kΩ 5% 0.01W 0402	3887	4822 117 13606	10kΩ 5% 0.01W 0402
3320	4822 051 30183	18kΩ 5% 0.062W	3565	4822 117 13548	1kΩ 5% 0402	3910	4822 117 13602	2.2kΩ 5% 0.01W 0402
3321	4822 051 30222	2.2kΩ 5% 0.062W	3566	4822 117 13548	1kΩ 5% 0402	3911	4822 117 13548	1kΩ 5% 0402
3322	4822 051 30682	6.8Ω 5% 0.062W	3567	4822 117 13548	1kΩ 5% 0402	3930	4822 117 12917	1Ω 5% 0.062W
3323	4822 051 30222	2.2kΩ 5% 0.062W	3568	4822 117 13548	1kΩ 5% 0402	3931	4822 117 12917	1Ω 5% 0.062W
3327	4822 117 13548	1kΩ 5% 0402	3579	4822 117 13548	1kΩ 5% 0402	3932	2322 704 61002	1kΩ 1%
3328	4822 117 13545	100Ω 1% 0402	3580	4822 117 13543	470Ω 5% 0402	3933	2322 704 63302	3.3kΩ 1% 0603
3329	4822 117 13545	100Ω 1% 0402	3581	3198 031 04730	47Ω 5% 0402	3951	4822 117 12917	1Ω 5% 0.062W
3340	4822 117 13601	22kΩ 5% 0402	3605	4822 117 13545	100Ω 1% 0402	3952	4822 117 12917	1Ω 5% 0.062W
3342	4822 117 13606	10kΩ 5% 0.01W 0402	3606	4822 117 13545	100Ω 1% 0402	3953	2322 704 61002	1kΩ 1%
3343	3198 031 04720	4.7kΩ 5% 0402	3607	4822 117 13545	100Ω 1% 0402	3954	2322 704 63302	3.3kΩ 1% 0603
3344	4822 117 13545	1kΩ 5% 0402	3608	4822 117 13545	100Ω 1% 0402	4002	4822 117 13605	Jumper 0402
3345	3198 031 04720	4.7kΩ 5% 0402	3609	4822 117 13545	100Ω 1% 0402	4005	4822 117 13605	Jumper 0402
3346	2322 706 75603	56kΩ 1% 0402	3610	4822 117 13601	22kΩ 5% 0402	4007	4822 117 13605	Jumper 0402
3347	3198 031 08210	820Ω 5% 0.5W	3612	4822 117 13543	470Ω 5% 0402	4008	4822 117 13605	Jumper 0402
3348	3198 031 04720	4.7kΩ 5% 0402	3613	3198 031 02290	22Ω 5% 0.1W 0402	4017	4822 117 13605	Jumper 0402
3349	3198 031 01820	1.8kΩ 5% 0.01W 0402	3614	3198 031 02290	22Ω 5% 0.1W 0402	4018	4822 117 13605	Jumper 0402
3357	4822 117 13548	1kΩ 5% 0402	3615	3198 031 02290	22Ω 5% 0.1W 0402	4023	4822 117 13605	Jumper 0402
3358	4822 117 13545	100Ω 1% 0402	3616	3198 031 02290	22Ω 5% 0.1W 0402	4062	4822 117 13605	Jumper 0402
3359	3198 031 03910	390Ω 1% 0402	3617	3198 031 02290	22Ω 5% 0.1W 0402	4255	4822 117 13605	Jumper 0402
3370	3198 031 06810	68Ω 5% 0.01W 0402	3618	3198 031 02290	22Ω 5% 0.1W 0402	4327	4822 051 30008	Jumper 0603
3371	4822 117 13545	100Ω 1% 0402	3619	3198 031 08210	820Ω 5% 0.5W	4331	4822 051 30008	Jumper 0603
3372	4822 117 13545	100Ω 1% 0402	3620	4822 117 13632	100kΩ 1% 0603 0.62W	4333	4822 051 30008	Jumper 0603
3374	5322 117 11726	10Ω 5%	3621	4822 117 13601	22kΩ 5% 0402	4334	4822 051 30008	Jumper 0603
3378	4822 117 13545	100Ω 1% 0402	3622	4822 117 13601	22kΩ 5% 0402	4360	4822 117 13605	Jumper 0402
3380	3198 031 05620	5.6kΩ 5% 0.01W 0402	3623	4822 117 13601	22kΩ 5% 0402	4361	4822 117 13605	Jumper 0402
3381	3198 031 05620	5.6kΩ 5% 0.01W 0402	3624	4822 117 13601	22kΩ 5% 0402	4362	4822 117 13605	Jumper 0402
3382	3198 031 05620	5.6kΩ 5% 0.01W 0402	3625	4822 117 13601	22kΩ 5% 0402	4363	4822 117 13605	Jumper 0402
3383	3198 031 05620	5.6kΩ 5% 0.01W 0402	3626	4822 117 13601	22kΩ 5% 0402	4580	4822 117 13605	Jumper 0402
3386	4822 117 13545	100Ω 1% 0402	3633	4822 117 13545	100Ω 1% 0402	4581	4822 117 13605	Jumper 0402
3389	4822 117 13545	100Ω 1% 0402	3634	4822 117 13545	100Ω 1% 0402	4583	4822 117 13605	Jumper 0402
3390	4822 117 13545	100Ω 1% 0402	3635	4822 117 13545	100Ω 1% 0402	4590	4822 117 13605	Jumper 0402
3391	4822 117 13545	100Ω 1% 0402	3638	4822 117 13545	100Ω 1% 0402	4601	4822 117 13605	Jumper 0402
3392	4822 117 13545	100Ω 1% 0402	3639	4822 117 13545	100Ω 1% 0402	4602	4822 117 13605	Jumper 0402
3393	4822 117 13545	100Ω 1% 0402	3641	4822 117 13597	330Ω 5% 0402 0.01W	4603	4822 117 13605	Jumper 0402
3394	3198 031 07590	75Ω 5% 0402	3642	4822 117 13597	330Ω 5% 0402 0.01W	4608	4822 117 13605	Jumper 0402
3401	2350 035 10229	4 x 22Ω 5% 1206	3643	4822 117 13597	330Ω 5% 0402 0.01W	4708	4822 051 30008	Jumper 0603
3402	2350 035 10229	4 x 22Ω 5% 1206	3644	4822 117 13597	330Ω 5% 0402 0.01W	4714	4822 117 13605	Jumper 0402
3403	2350 035 10229	4 x 22Ω 5% 1206	3645	4822 117 13597	330Ω 5% 0402 0.01W	4720	4822 051 30008	Jumper 0603
3404	2350 035 10229	4 x 22Ω 5% 1206	3646	4822 117 13597	330Ω 5% 0402 0.01W	4836	4822 051 30008	Jumper 0603
3405	2350 035 10229	4 x 22Ω 5% 1206	3680	4822 051 30222	2.2kΩ 5% 0.062W	4838	4822 051 30008	Jumper 0603
3406	2350 035 10229	4 x 22Ω 5% 1206	3681	4822 051 30221	220Ω 5% 0.062W	4888	4822 117 13605	Jumper 0402
3407	2350 035 10229	4 x 22Ω 5% 1206	3683</					

5139	4822 051 20008	Jumper 0805	7002	9340 425 20115	BC847BS	2715	5322 126 11578	1nF 10% 50V 0603
5251	2422 549 45333	Bead 120Ω 100MHz	7003	9339 693 90135	BCP69-25	2716	4822 126 14241	330pF 0603 50V
5252	2422 549 45333	Bead 120Ω 100MHz	7004	3198 010 42310	BC847BW	2717	5322 121 42498	680nF 5% 63V
5259	2422 549 45333	Bead 120Ω 100MHz	7005	9340 547 13215	BSH103	2718	4822 122 33761	22pF 5% 50V
5262	2422 535 94134	10µH 20% 0805	7011		For SW see item 0601	2719	5322 126 11578	1nF 10% 50V 0603
5267	2422 536 00339	33µ 20%	7012	3198 010 42310	BC847BW	2720	2020 552 96326	220nF 10% 16V
5268	2422 535 94995	10µF 20% 10145	7013	3198 010 42310	BC847BW	2721	4822 126 13881	470pF 5% 50V
5304	4822 157 11499	Bead 60Ω at 100MHz	7014	3198 010 42310	BC847BW	2722	4822 126 13881	470pF 5% 50V
5309	3198 018 31290	12µH 10%	7015	9322 208 05668	SM NE555D	2724	2020 552 96684	470nF 10% 25V 0805
5321	3198 018 33970	0.39µF 10% 0805	7016	9322 208 05668	SM NE555D	2726	4822 126 14549	33nF 16V 0603
5324	4822 157 71334	0.68µH 5% 1008	7017	9322 208 05668	SM NE555D	2727	5322 126 11578	1nF 10% 50V 0603
5370	4822 157 11716	Bead 30Ω at 100MHz	7018	5322 130 60159	BC846B	2728	4822 126 14241	330pF 0603 50V
5371	4822 157 11716	Bead 30Ω at 100MHz	7019	5322 130 60159	BC846B	2729	5322 121 42498	680nF 5% 63V
5372	4822 157 11716	Bead 30Ω at 100MHz	7051	3104 317 07511	Softw. (check Prod.Surv.)	2730	2020 552 96684	470nF 10% 25V 0805
5530	2422 549 45333	Bead 120Ω 100MHz	7052	3104 317 06722	Softw. (check Prod.Surv.)	2764	4822 126 14491	2.2µF 10V 0805
5560	4822 157 11716	Bead 30Ω at 100MHz	7053	3104 317 06742	Softw. (check Prod.Surv.)	2766	4822 126 14491	2.2µF 10V 0805
5580	4822 157 71304	1µH 10% 0805	7054	3104 317 06691	Softw. (check Prod.Surv.)	2768	4822 124 40255	100µF 20% 63V
5605	2422 549 45333	Bead 120Ω 100MHz	7075	4822 130 11155	PDTC114ET	2769	4822 124 40255	100µF 20% 63V
5607	2422 549 45333	Bead 120Ω 100MHz	7099		For SW see item 7052	2777	2020 552 96683	220nF 10% 50V
5636	2422 549 45333	Bead 120Ω 100MHz	7119	5322 130 60159	BC846B	2778	4822 124 40769	4.7µF 20% 100V
5680	2422 549 45333	Bead 120Ω 100MHz	7138	5322 130 60159	BC846B	2779	2020 552 96683	220nF 10% 50V
5683	2422 549 45333	Bead 120Ω 100MHz	7260	9322 139 16668	LF33CPT	2780	2020 552 96683	220nF 10% 50V
5684	2422 549 45333	Bead 120Ω 100MHz	7262	9322 202 34668	L5973D	2781	2020 552 96683	220nF 10% 50V
5685	2422 549 45333	Bead 120Ω 100MHz	7271	3198 010 42310	BC847BW	2783	4822 124 81151	22µF 50V
5686	2422 549 45333	Bead 120Ω 100MHz	7272	3198 010 42310	BC847BW	2786	2238 586 15641	22nF 10% 50V 0603
5687	2422 549 45333	Bead 120Ω 100MHz	7320	3198 010 42310	BC847BW	2788	4822 124 40255	100µF 20% 63V
5720	4822 157 11716	Bead 30Ω at 100MHz	7370	9340 550 49115	PUMH7	2789	2020 552 96684	470nF 10% 25V 0805
5721	4822 157 11716	Bead 30Ω at 100MHz	7371	9340 550 49115	PUMH7	2790	4822 124 40255	100µF 20% 63V

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5882	3198 018 51080	1µH 10% 0603	7377	9340 425 10115	BC857BS	3701	4822 051 30103	10kΩ 5% 0.062W
5910	2422 536 00667	1000µF 20% 7032	7401	9322 206 86671	GM1501-BD	3702	4822 051 30682	6.8Ω 5% 0.062W
5920	2422 549 45333	Bead 120Ω 100MHz	7501	9322 199 17671	K4D263238M-QC50	3703	4822 051 30333	33kΩ 5% 0.062W
5930	2422 535 94134	10µH 20% 0805	7530		For SW see item 7051	3704	4822 117 10833	10kΩ 1% 0.1W
5931	2422 536 00689	220µF 20%	7531		For SW see item 7053	3705	4822 051 20828	8.2Ω 5% 0.1W
5932	2422 535 94134	10µH 20% 0805	7532	9352 691 71115	NE56610-27GW	3706	4822 051 30472	4.7Ω 5% 0.062W
5952	2422 535 94134	10µH 20% 0805	7560	9352 334 10118	TDA9178T/N1	3707	4822 051 30683	68kΩ 5% 0.062W
5953	2422 536 00689	220µF 20%	7561	3198 010 42310	BC847BW	3708	4822 051 30563	56kΩ 5% 0.062W
5954	2422 535 94134	10µH 20% 0805	7562	9322 199 24668	L7808CD2T	3709	4822 117 11503	220Ω 1% 0.1W
5984	2422 549 45333	Bead 120Ω 100MHz	7563	4822 209 73852	PMBT2369	3710	4822 051 30223	22kΩ 5% 0.062W
5985	2422 549 45333	Bead 120Ω 100MHz	7579	4822 130 11155	PDTC114ET	3711	4822 050 21204	120kΩ 1% 0.6W
5986	2422 549 45333	Bead 120Ω 100MHz	7580	9322 199 16668	M74HC590T	3712	4822 051 30103	10kΩ 5% 0.062W
5987	2422 549 45333	Bead 120Ω 100MHz	7581	9322 199 16668	M74HC590T	3713	4822 116 52207	1.2kΩ 5% 0.5W
5988	2422 549 45333	Bead 120Ω 100MHz	7582	9322 201 05671	CY62256LL-70ZC	3714	4822 117 12925	47kΩ 1% 0.063W 0603
5989	2422 549 45333	Bead 120Ω 100MHz	7583	9351 870 00118	74HC573PW	3715	4822 117 12925	47kΩ 1% 0.063W 0603
5990	2422 549 45333	Bead 120Ω 100MHz	7584	9351 870 00118	74HC573PW	3716	4822 117 12925	47kΩ 1% 0.063W 0603
5991	2422 549 45333	Bead 120Ω 100MHz	7585	3198 010 42310	BC847BW	3717	4822 116 52234	100kΩ 5% 0.5W
5994	2422 549 45333	Bead 120Ω 100MHz	7604	9352 607 39118	74LVC14APW	3718	4822 117 13632	100kΩ 1% 0.603 0.62W
5996	2422 549 45333	Bead 120Ω 100MHz	7605	4822 209 60792	74HC4053D	3721	4822 051 30472	4.7Ω 5% 0.062W
5997	2422 549 45333	Bead 120Ω 100MHz	7606	9322 199 56668	ADG781BCP	3722	4822 051 30683	68kΩ 5% 0.062W
5998	2422 549 45333	Bead 120Ω 100MHz	7607	9322 199 80668	SM5301BS-G	3723	4822 051 30563	56kΩ 5% 0.062W
			7693		For SW see item 7054	3724	4822 117 11503	220Ω 1% 0.1W
			7706	9351 742 70118	74HC08PW	3725	4822 051 30223	22kΩ 5% 0.062W
			7708	9340 425 20115	BC847BS	3726	4822 117 11503	220Ω 1% 0.1W
			7710	9340 310 50215	PDTA143ET	3727	4822 117 11503	220Ω 1% 0.1W
			7713	3198 010 42310	BC847BW	3728	4822 117 11449	2.2kΩ 5% 0.1W 0805
			7714	3198 010 42310	BC847BW	3743	4822 051 30223	22kΩ 5% 0.062W
			7740	9322 183 05668	TS482ID	3744	4822 117 12925	47kΩ 1% 0.063W 0603
			7872	9352 686 35118	PCA9515DP	3747	4822 117 11449	2.2kΩ 5% 0.1W 0805
			7887	3198 010 42310	BC847BW	3748	4822 116 83883	470Ω 5% 0.5W
			7910	4822 130 42804	BC817-25	3750	4822 117 11449	2.2kΩ 5% 0.1W 0805
			7920	9322 163 24668	L7808CDT	3756	4822 117 11449	2.2kΩ 5% 0.1W 0805
			7930	5322 209 90529	MC34063AD	3757	4822 117 11449	2.2kΩ 5% 0.1W 0805
			7952	5322 209 90529	MC34063AD	3760	4822 117 12891	220kΩ 1%
			7992	9322 142 88668	LF25CDT	3761	4822 051 20109	10Ω 5% 0.1W
			7995	9322 189 19668	LD1086D2T18	3762	4822 051 20109	10Ω 5% 0.1W

PDP Audio [C]

Various

1735	2422 025 10768	Connector 3p m	3790	4822 051 30272	2.7kΩ 5% 0.062W
1736	2422 025 10768	Connector 3p m	3791	4822 051 30272	2.7kΩ 5% 0.062W
1739	2422 025 10768	Connector 9p m	3792	4822 051 30103	10kΩ 5% 0.062W
1M02	2422 025 11244	Connector 7p m	3793	4822 051 30103	10kΩ 5% 0.062W
8302	3104 311 07591	Cable 7P/820/7P	3798	4822 051 30153	15kΩ 5% 0.062W
			3999	4822 051 30101	100Ω 5% 0.062W
			9717	4822 051 30008	Jumper 0603
2702	5322 126 11578	1nF 10% 50V 0603			
2704	5322 126 11578	1nF 10% 50V 0603			
2705	2020 552 96684	470nF 10% 25V 0805	5701	2422 536 00385	68µH 10%
2706	2222 580 15649	100nF 10% 50V 0805	5702	2422 536 00385	68µH 10%
2707	4822 126 14585	100nF 10% 0805 50V	5703	4822 157 11716	Bead 30Ω at 100MHz
2708	2020 552 96326	220nF 10% 16V	5707	4822 157 11411	Bead 80Ω at 100MHz
2709	4822 126 13881	470pF 5% 50V	5708	4822 157 11411	Bead 80Ω at 100MHz
2710	4822 126 13881	470pF 5% 50V	5711	4822 157 11411	Bead 80Ω at 100MHz
2711	5322 126 11578	1nF 10% 50V 0603	5712	4822 157 11411	Bead 80Ω at 100MHz
2712	2020 552 96684	470nF 10% 25V 0805			
2713	2020 552 96684	470nF 10% 25V 0805			
2714	4822 126 14549	33nF 16V 0603			



 6701 4822 130 11397 BAS316 6710 4822 130 11551 UDZS10B 6711 4822 130 11551 UDZS10B	EMC Filter [EMC] Various 1320 2422 025 16545 Connector 10p m 1330 2422 025 16545 Connector 10p m 1345 2422 025 16835 Connector 3p m 1355 2422 025 16835 Connector 3p m	 6101 4822 130 11564 UDZ3.9B 6103 4822 130 83915 TLMV3100 6105 4822 130 11564 UDZ3.9B 6127 9322 140 63685 TEMD5000
 7700 9322 163 86682 TDA7490L 7701 3198 010 42310 BC847BW 7703 3198 010 42310 BC847BW 7704 3198 010 42310 BC847BW 7705 3198 010 42310 BC847BW 7706 3198 010 42320 BC857BW 7707 3198 010 42310 BC847BW 7710 3198 010 42310 BC847BW 7711 3198 010 42310 BC847BW 7712 3198 010 42310 BC847BW 7713 3198 010 42310 BC847BW	 7103 3198 010 42320 BC857BW 7105 3198 010 42320 BC857BW 7107 9322 206 81667 TSOP34836YA1 7120 5322 209 82941 LM358D	 7700 9322 163 86682 TDA7490L 7701 3198 010 42310 BC847BW 7703 3198 010 42310 BC847BW 7704 3198 010 42310 BC847BW 7705 3198 010 42310 BC847BW 7706 3198 010 42320 BC857BW 7707 3198 010 42310 BC847BW 7710 3198 010 42310 BC847BW 7711 3198 010 42310 BC847BW 7712 3198 010 42310 BC847BW 7713 3198 010 42310 BC847BW
Side I/O [D] Various 1001 2422 033 00442 Connector 2P f 1002 2422 026 05587 Sock Cinch 2P f RdWh	 3300 4822 051 30101 100Ω 5% 0.062W 3301 4822 051 30101 100Ω 5% 0.062W 3302 4822 051 30101 100Ω 5% 0.062W 3303 4822 051 30101 100Ω 5% 0.062W 3304 4822 051 30101 100Ω 5% 0.062W 3305 4822 051 30101 100Ω 5% 0.062W 3306 4822 051 30101 100Ω 5% 0.062W 3307 4822 051 30101 100Ω 5% 0.062W	 3300 4822 051 30101 100Ω 5% 0.062W 3301 4822 051 30101 100Ω 5% 0.062W 3302 4822 051 30101 100Ω 5% 0.062W 3303 4822 051 30101 100Ω 5% 0.062W 3304 4822 051 30101 100Ω 5% 0.062W 3305 4822 051 30101 100Ω 5% 0.062W 3306 4822 051 30101 100Ω 5% 0.062W 3307 4822 051 30101 100Ω 5% 0.062W
 2004 4822 126 14241 330pF 0603 50V 2005 2020 552 94427 100pF 5% 50V 2006 4822 126 14241 330pF 0603 50V 2007 2020 552 94427 100pF 5% 50V	 5300 2422 549 43062 Bead 600Ω at 100MHz 5301 2422 549 43062 Bead 600Ω at 100MHz 5302 2422 549 43062 Bead 600Ω at 100MHz 5303 2422 549 43062 Bead 600Ω at 100MHz 5304 2422 549 43062 Bead 600Ω at 100MHz 5305 2422 549 43062 Bead 600Ω at 100MHz 5306 2422 549 43062 Bead 600Ω at 100MHz 5307 2422 549 43062 Bead 600Ω at 100MHz 5308 2422 549 43062 Bead 600Ω at 100MHz 5309 2422 549 43062 Bead 600Ω at 100MHz 5310 2422 549 43062 Bead 600Ω at 100MHz 5311 2422 549 43062 Bead 600Ω at 100MHz 5312 2422 549 43062 Bead 600Ω at 100MHz 5313 2422 549 43062 Bead 600Ω at 100MHz	 LED + Switch [J]
 6000 4822 130 11416 PDZ6.8B 6001 4822 130 11416 PDZ6.8B 6002 4822 130 11416 PDZ6.8B 6003 4822 130 11416 PDZ6.8B 6004 4822 130 11416 PDZ6.8B 6005 4822 130 11416 PDZ6.8B 6006 4822 130 11416 PDZ6.8B 6007 4822 130 11416 PDZ6.8B	 0320 2422 025 16545 Connector 10p m 1101 2422 128 03123 Switch 2p 2pos 30V	 2107 4822 124 12095 100μF 20% 16V 2120 3198 030 71090 10μF 20% 35V 2126 4822 126 14583 470nF 10% 16V 0805
Top Control [E] Various 0345 4822 267 10459 Connector 3p 1701 2422 128 02778 Tact switch 1702 2422 128 02778 Tact switch 1703 2422 128 02778 Tact switch 1704 2422 128 02778 Tact switch 1705 2422 128 02778 Tact switch 8345 3104 311 06551 Cable 3P/1300/3P	 3101 4822 051 30151 150Ω 5% 0.062W 3103 4822 051 30331 330Ω 5% 0.062W 3105 4822 051 30681 680Ω 5% 0.062W 3106 4822 051 30151 150Ω 5% 0.062W 3107 4822 051 30471 47Ω 5% 0.062W 3108 4822 051 30103 10kΩ 5% 0.062W 3109 4822 051 30101 100Ω 5% 0.062W 3120 4822 051 30472 4.7Ω 5% 0.062W 3121 4822 051 30103 10kΩ 5% 0.062W 3122 4822 051 30332 3.3Ω 5% 0.062W 3123 4822 051 30332 3.3Ω 5% 0.062W 3124 4822 051 30102 1kΩ 5% 0.062W 3126 2322 702 60335 3.3MΩ 5% 0.0603 3127 2322 702 60335 3.3MΩ 5% 0.0603 3128 4822 051 30472 4.7Ω 5% 0.062W 3100	 5100 2422 549 43769 Bead 30Ω at 100MHz
 3001 4822 051 20391 390Ω 5% 0.1W 3003 4822 117 13528 200Ω 1% 0.125W 0805 3005 4822 117 11951 2kΩ 1% 0.1W 3009 4822 117 11534 1.1kΩ 1% 0.1W 3011 4822 117 10845 620Ω 1% 0.1W 3999 4822 051 20471 470Ω 5% 0.1W 9001 4822 051 20008 Jumper 0805 9003 4822 051 20008 Jumper 0805 9005 4822 051 20008 Jumper 0805 9006 4822 051 20008 Jumper 0805	 4101 4822 051 30008 Jumper 0603 4107 4822 051 30008 Jumper 0603 4108 4822 051 30008 Jumper 0603 4111 4822 051 30008 Jumper 0603	

11. Revision List

Manual xxxx xxx xxxx.0

- First release.

Manual xxxx xxx xxxx.1

- Second release.

Block diagrams and schematics updated.
Description of white tone alignment added.